Rumen8

Easy Dairy Cow Diets

Created by Richard Morris and Martin Staines

Version 1.3

Western DAIRY

Dairy Australia

Your Levy at Work

GOVERNMENT OF WESTERN AUSTRALIA

Department of Agriculture and Food

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Introduction

Rumen8 is a software application running on Microsoft Windows computers that allows farmers and consultants to easily manage dairy cow diets to increase production and reduce costs. It was originally developed by the staff of the Department of Agriculture and Food, Western Australia as an 'in-house' tool for managing the dairy herds on the Vasse Research Station near Busselton, Western Australia. An emphasis on ease of use sets it apart from many other nutrition packages and it is this that makes it ideal for creating or checking cow diets on the dairy computer by farm managers, owners and consultants.

Version 1 of Rumen8 was released free to the dairy industry and is used in Australia on research farms, by consultants and farm managers. Its nutrition model is suitable for the pasture-dominated diets common across Australia.

Rumen8 was given to the Western Australian dairy industry by the Department of Agriculture and Food in 2014. The new owners, Western Dairy, have provided funds to update it ensuring compatibility with contemporary versions of Windows and the addition of sought after functions to make the process of managing dairy diets even easier.

What does Rumen8 do?

Rumen8 allows the user to design a diet from up to 10 feeds and ensure a cows dietary needs are met. Multiple feeds can be stored and compared and if milk and feed prices are entered, the difference between feed price and return from milk calculated.

Rumen8 uses a relatively simple nutrition model that we have found accurate enough over many years using it on farms and Research Stations. Many more sophisticated models of dairy cow nutrition exist but they require a higher level of user knowledge, less readily available and more expensive feed analysis and more time to use. We have found Rumen8 provides a good balance between ease and speed of use and performance that is 'good enough' for the pasture dominated dairy diets common in Australia.

Dairy Australia have independently evaluated Rumen8 version 1 against a range of nutrition models in use in Australia at the time and it performed admirably. You can read the report yourself as it is available from the Rumen8 and Dairy Australia web sites (A review of 11 applied dairy nutrition models used in Australia, 2009). The nutrition model in Rumen8 version 2 is unchanged from version 1.

What Rumen8 doesn't do

Like most nutrition programs, Rumen8 works on a linear response to feeding. This means it assumes the same response to a kilogram of grain whether it is the first kilogram or the tenth kilogram fed to the cow. Due to this Rumen8 can be misleading when asking questions such as 'What happens if I feed another kilogram of grain' as it presents the average response for the first diet, and then the average response for the second diet that includes the additional feed. Rumen8 cannot be used to predict the response was to just the last kilogram of additional feed. As a general rule we would suggest halving the marginal response for grain. When Rumen8 calculates you would get an additional 2 litres of milk for an extra 1 kg of grain, we suggest you reduce the predicted milk response by half (in this case to 1 litre).

A warning before you start

Like any cow nutrition application, Rumen8 depends on a model of a cow that it 'feeds' and then estimates milk production and growth. No model is completely accurate and it is possible to create a balanced diet in Rumen8 that will reduce cow performance or even adversely affect

their health. For this reason we recommend Rumen8 is used with your nutritionist, and depending on your level of knowledge, between their visits to adjust diets.

That statement leads us on nicely to the inevitable disclaimer.

Terms and conditions

While all reasonable efforts have been taken to ensure the accuracy of the Rumen8 application, use of the information it provides is at one's own risk. To the fullest extent permitted by Australian law, Western Dairy, Dairy Australia and the developer disclaims all liability for any losses, costs, damages and the like sustained or incurred as a result of the use of or reliance upon the information provided, including liability stemming from reliance upon any part which may contain inadvertent errors, whether typographical or otherwise, or omissions of any kind.

Acknowledgements

Martin Staines and Richard Morris developed Rumen8 while they were employed by the Department of Agriculture and Food, Western Australia. The Western Australian Government has now given Rumen8 to the Western Australian dairy industry. Thanks must go to the Board of Western Dairy for seeing value in it and providing a home and funds for development of version 2. Thank you also to Neil Lane and David Beca from Interlact Australia who have provided a wealth of ideas for future development over the years. There are still plenty left for Version 3.

What's new in version 2?

- Compatibility with Windows Vista, 7, 8 and 8.1.
- Library files such as the feed, cow and preferences are now kept under the user documents folder allowing easy access and backup.
- Supports multiple users on one computer with independent feed libraries and preferences.
- New Diet tab that presents only the 6 most important diet parameters to the user to allow easier diet balancing for new users.
- New Prices tab that allows the user to modify component feed costs for the current diet without going into the feed editor.
- New Costs tab that allows the user to enter 24 milk prices, 12 as cents per litre and 12 as a payment for fat + protein with a volume discount. Switching between milk prices only takes two clicks.
- Online updating from within Rumen8.
- Diets can be created for non-lactating mature cows.
- Cosmetic updates to reflect the user interface on later versions of Windows.
- The user interface has been de-cluttered to provide fewer distractions for new users.
- The feed library editor now displays feed parameters as the user moves through them and can be enlarged to view more of large feed libraries.
- Multiple feeds can be selected and unselected in the feed library editor.
- Feed names must now be unique within a library.
- Local feed libraries can be used in folders with saved diets so smaller feed libraries can be created that are farm specific.
- Total excess protein is now calculated, not just excess ERDP.
- The maximum number of feeds has been doubled to 2000.

- Improved error and file handling so error messages, particularly with the library files, are more specific and easier to understand.
- The Optimiser tab is hidden by default, as it is no longer a supported function.
- Library files are checked on start and if they have been deleted or corrupted Rumen8 offers to re-copy the default libraries.
- 5% safety margin now applies to protein, not just energy.
- Added the calculation of NDF from forage as a percentage of live weight.
- Bug fixed that may have resulted in incorrect ADIN calculation in some situations.
- Bug fixed where reverting a feed to the pre editing parameters set aN to 0.
- Bug fixed where ME requirement for growth was under estimated if the cow was losing weight.
- The Cow tab now calculates milk solids from yield and components entered by the user.
- User settings are now stored in the application settings file, not the registry.
- Version 2 of Rumen8 requires a new registration code.
- A new user guide for Rumen8 version 2.
- A new home on the Internet at http://www.rumen8.com.au and support at support@rumen8.com.au

Getting Started

System requirements

Rumen8 requires the Microsoft Windows operating system to run. This can be Windows XP, Vista, 7, 8 or 8.1. It is recommended you have run Windows Update and installed all the updates recommended by Microsoft.

If you computer can run Windows adequately, it will be sufficient to run Rumen8.

Rumen8 requires the Microsoft NET Framework version 4 or higher to be installed. If your computer has been fully updated this will be installed automatically for Windows XP. For Windows Vista, 7 and 8 version 4.5 of the NET Framework will be installed automatically and this is backward compatible with version 4.

Rumen8 also requires the Microsoft PowerPacks10 software. If this is not installed on your computer it will be installed automatically during the installation of Rumen8 if your computer has an Internet connection. If your computer is offline the PowerPack10 software can be downloaded from the Rumen8 or Microsoft websites on another machine and then installed separately before installing Rumen8.

Upgrading from Rumen8 version 1

Rumen8 version 2 can be installed on a computer that already has Rumen8 version 1 installed and they will run independently of each other and will not share library files.

For a clean install it is recommended you uninstall Rumen8 version 1 before installing the new version.

If you do this first copy your version 1 library files (feed.csv, prefs.csv and cow.csv) from the application directory to somewhere safe such as the Desktop.

The default location of the application directory is C:\Program Files\Department of Agriculture and Food Western Australia\Rumen8.

Diet files, feed library files (feed.csv) and cow files (cow.csv) are the same format and interchangeable. This means they can be copied from your version 1 installation without change to the new library folder at \Documents\Rumen8\Libraries.

However, the preferences library file (prefs.csv) has changed and that means the version 1 prefs.csv file is not compatible with Rumen8 version 2. Given the small number of preference settings I'd suggest the first time you run Rumen8 version 2 check each parameter in the preferences to ensure the defaults settings are the same as you have been using in Rumen8 version 1.

Installation

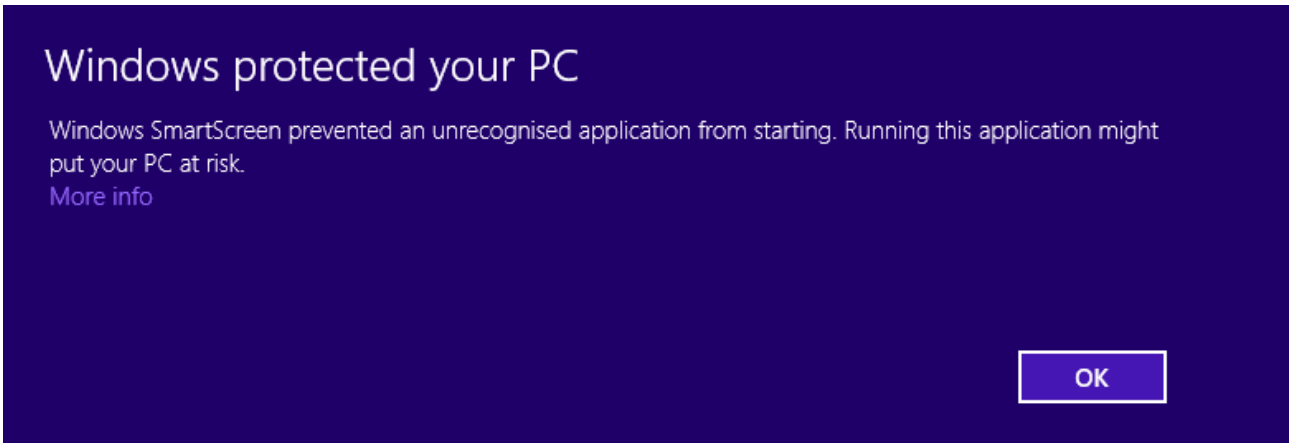
The Rumen8 setup file can been downloaded from the Downloads page of the Rumen8 website at http://www.rumen8.com.au

Once the executable file has been downloaded to your Downloads folder (the default download location) double click on the file in Windows Explorer to commence the installation process.

Windows 8 users only

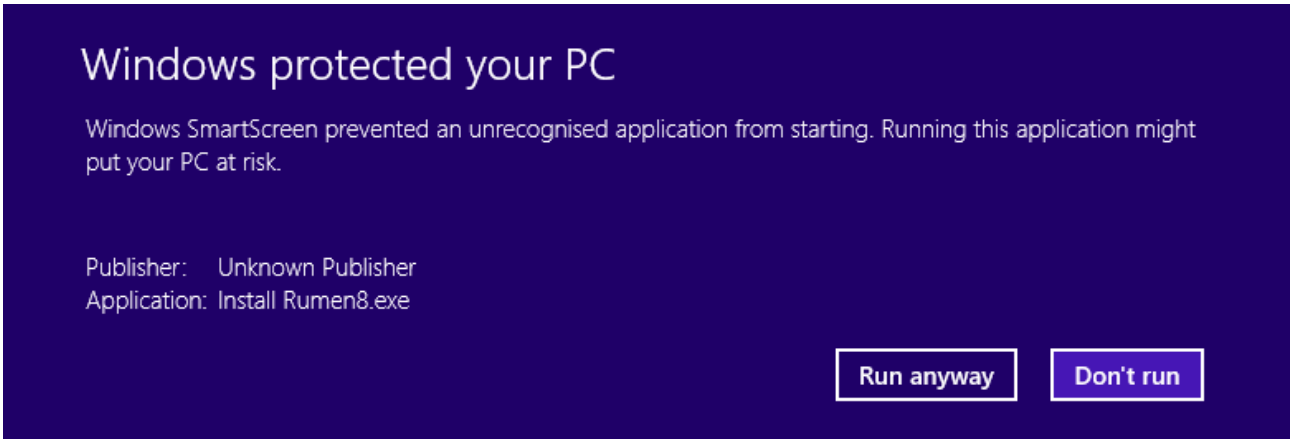
Microsoft has added another layer of security to try and protect their users from malicious downloads. The Rumen8 download will trigger a warning because it is from a software developer they do not recognise. When you double click on the Rumen8 install executable to run it a warning banner will appear across the centre of the screen.

Figure 1. Windows 8 unknown software developer warning.


Windows protected your PC
Windows SmartScreen prevented an unrecognised application from starting. Running this application might put your PC at risk.
More info
OK

Simply click on the 'More info' link and the option to run the installer anyway will appear.

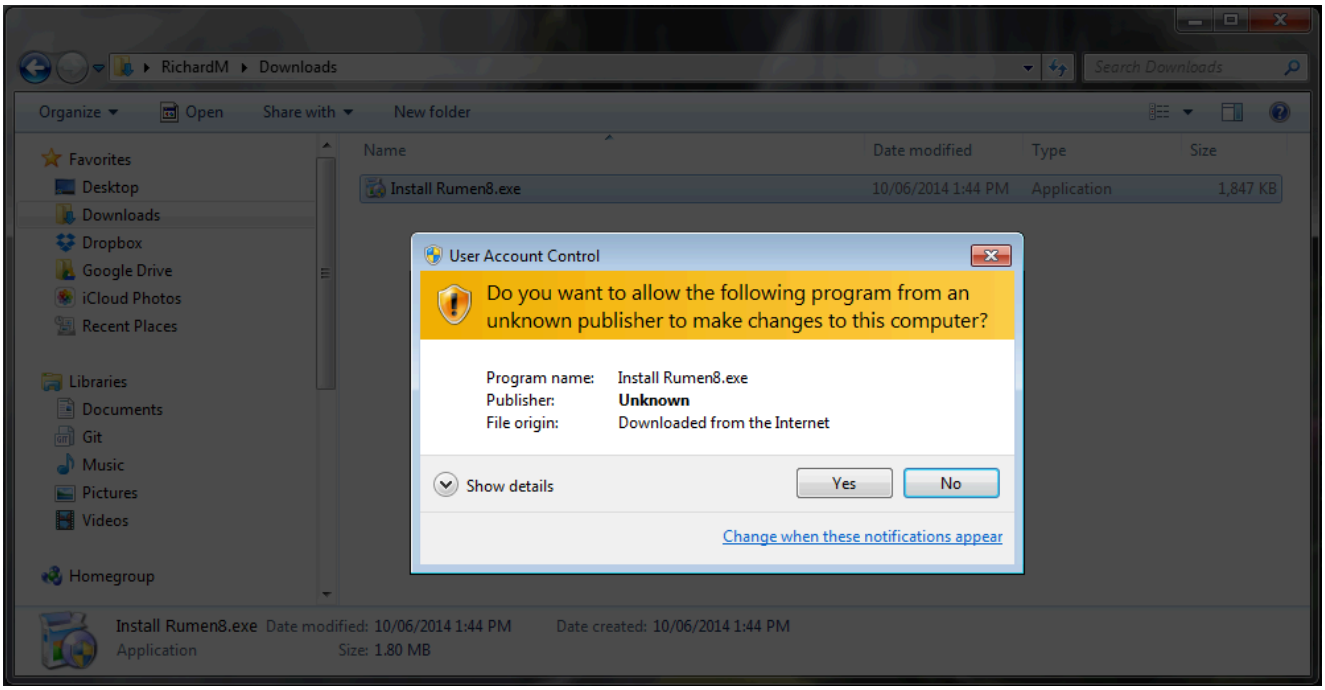
Figure 2. Run the installer anyway option exposed.


Windows protected your PC
Windows SmartScreen prevented an unrecognised application from starting. Running this application might put your PC at risk.
Publisher: Unknown Publisher
Application: Install Rumen8.exe
Run anyway
Don't run

Click on the 'Run anyway' button to continue installing Rumen8.

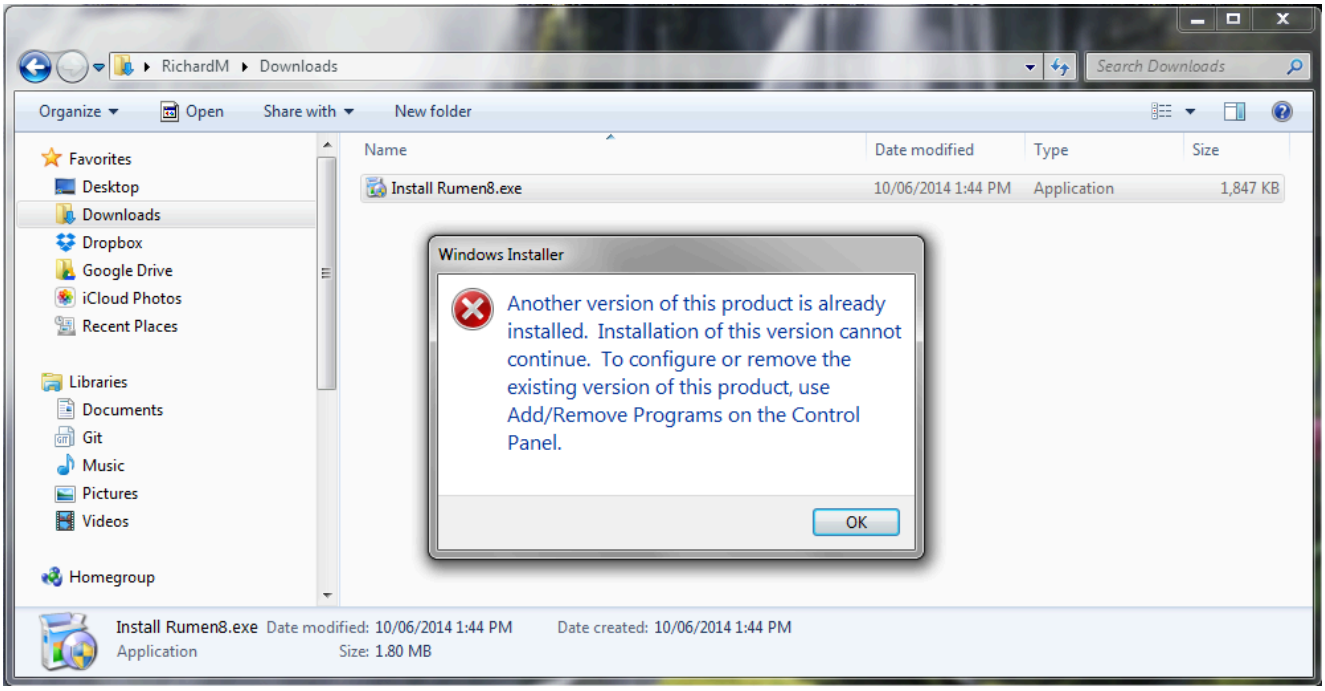
Windows may ask for confirmation that you want to allow the following program from an unknown publisher to make changes to this computer.

Figure 3. Windows user access control during Rumen8 installation.



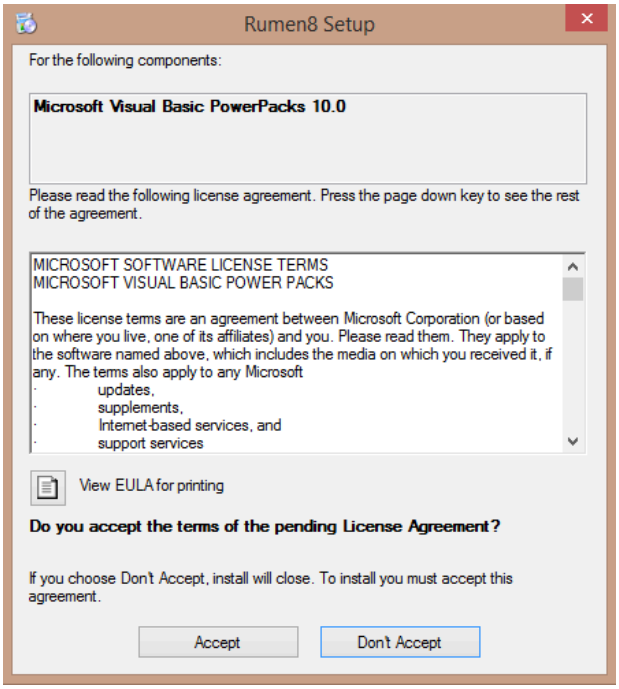
Click 'Yes' to continue the installation. If you have an older version of Rumen8 version 2 installed the installation program will halt and ask you to uninstall it. Do this in the Control Panel under the 'Programs', 'Programs and Features' and then 'Uninstall a program' section and then restart the installation of the new version of Rumen8.

Figure 4. Warning an earlier version of Rumen8 is already installed.



If you have successfully started the installer then either the Rumen8 Setup Wizard or the PowerPacks10 installer will appear. If you do not have PowerPacks10 installed previously a window will appear asking for you to accept the license agreement from Microsoft before installing the software.

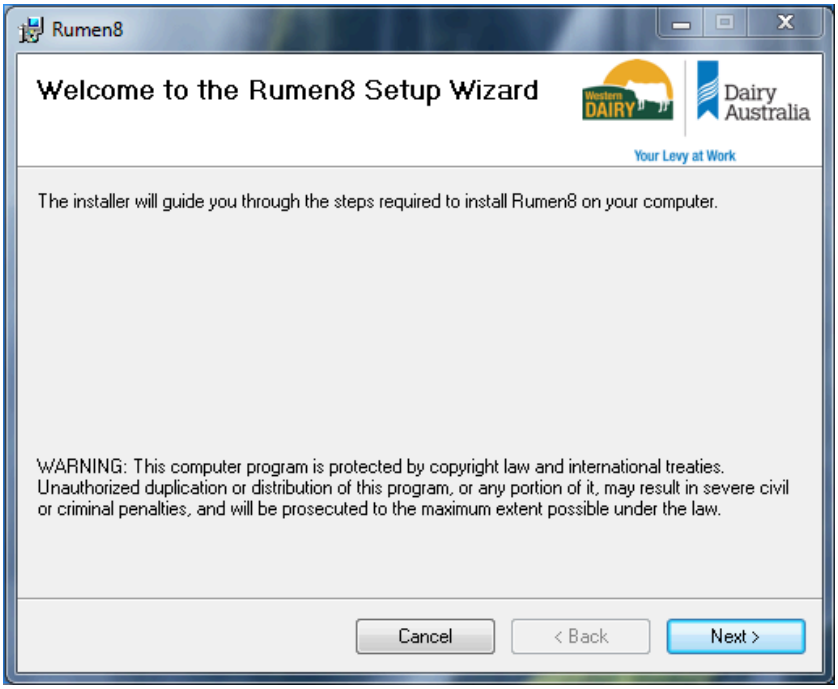
Figure 5. The PowerPacks 10 license agreement window.


Rumen8 Setup
For the following components:
Microsoft Visual Basic PowerPacks 10.0
Please read the following license agreement. Press the page down key to see the rest of the agreement.
MICROSOFT SOFTWARE LICENSE TERMS
MICROSOFT VISUAL BASIC POWER PACKS
These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. Please read them. They apply to the software named above, which includes the media on which you received it, if any. The terms also apply to any Microsoft
· updates,
· supplements,
· Internet-based services, and
· support services
View EULA for printing
Do you accept the terms of the pending License Agreement?
If you choose Don't Accept, install will close. To install you must accept this agreement.
Accept
Don't Accept

Click the 'Accept' button and the software will download and install. If your computer is not connected to the Internet the PowerPacks10 installer can be downloaded from the Rumen8 or Microsoft websites.

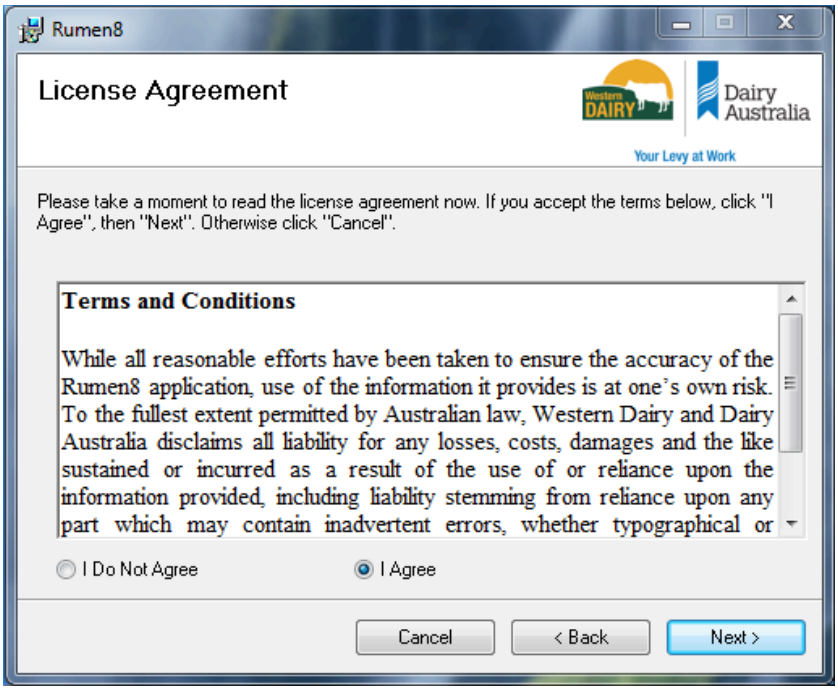
Once that is installed the Rumen8 Setup Wizard window will appear and you can install Rumen8 itself.

Figure 6. The Rumen8 setup wizard.


Rumen8
Welcome to the Rumen8 Setup Wizard
Western DAIRY
Dairy Australia
Your Levy at Work
The installer will guide you through the steps required to install Rumen8 on your computer.
WARNING: This computer program is protected by copyright law and international treaties. Unauthorized duplication or distribution of this program, or any portion of it, may result in severe civil or criminal penalties, and will be prosecuted to the maximum extent possible under the law.
Cancel
< Back
Next >

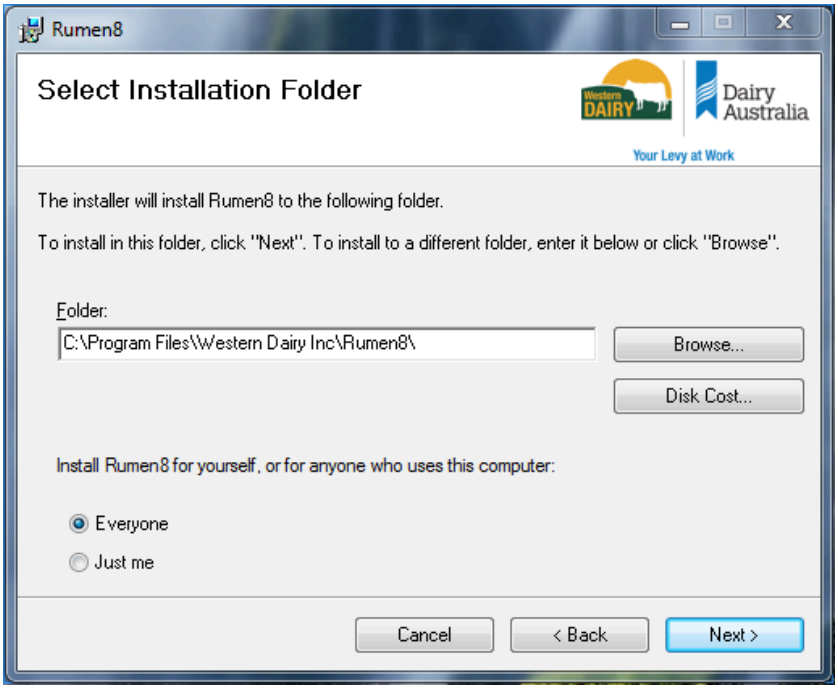
Click on the 'Next' button to continue to the license agreement window.

Figure 7. The Rumen8 license agreement window.


Rumen8
License Agreement
Western DAIRY
Dairy Australia
Your Levy at Work
Please take a moment to read the license agreement now. If you accept the terms below, click "I Agree", then "Next". Otherwise click "Cancel".
Terms and Conditions
While all reasonable efforts have been taken to ensure the accuracy of the Rumen8 application, use of the information it provides is at one's own risk. To the fullest extent permitted by Australian law, Western Dairy and Dairy Australia disclaims all liability for any losses, costs, damages and the like sustained or incurred as a result of the use of or reliance upon the information provided, including liability stemming from reliance upon any part which may contain inadvertent errors, whether typographical or
I Do Not Agree
I Agree
Cancel
< Back
Next >

Read the Terms and Conditions and if you agree with them click on the 'I Agree' button and then the 'Next' button to choose the installation folder.

Figure 8. The installation folder window.

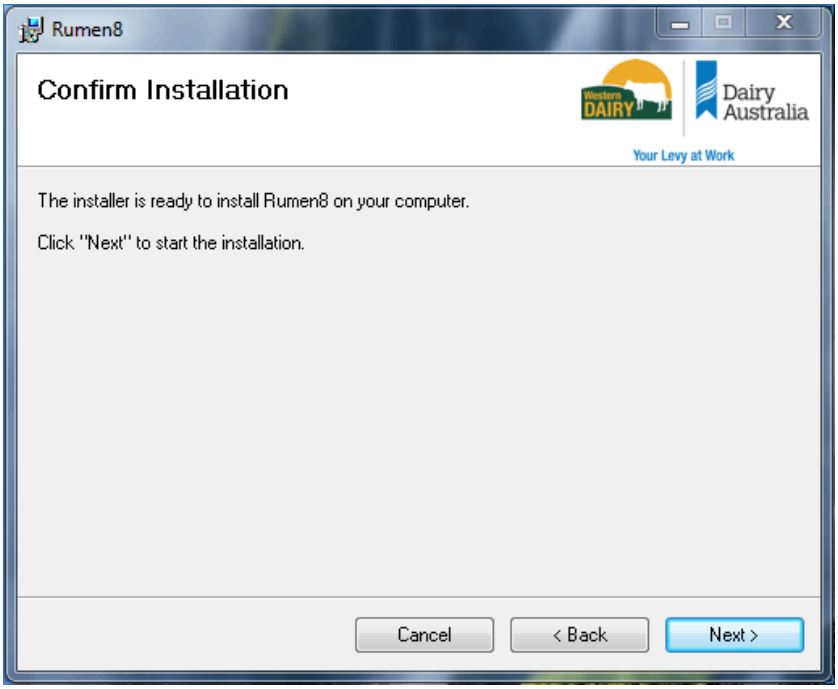

Rumen8
Select Installation Folder
Western DAIRY
Dairy Australia
Your Levy at Work
The installer will install Rumen8 to the following folder.
To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".
Folder:
C:\Program Files\Western Dairy Inc\Rumen8\
Browse...
Disk Cost...
Install Rumen8 for yourself, or for anyone who uses this computer:
Everyone
Just me
Cancel
< Back
Next >

Use the 'Browse' button to change the installation folder if required. The default folder will be suitable for almost everyone. If you will be sharing Rumen8 with another user on your machine leave the second setting as 'Everyone'. If you are the only user who will use Rumen8 on this computer change the setting to 'Just me'.

If the installation is left on 'Everyone' the Rumen8 folder icon in the Start Menu will be present for all users (Windows 7 and earlier). When Rumen8 is started for the first time for a second user a new Rumen8 user folder will be created with independent library files (feed library, preferences, milk prices and cow files).

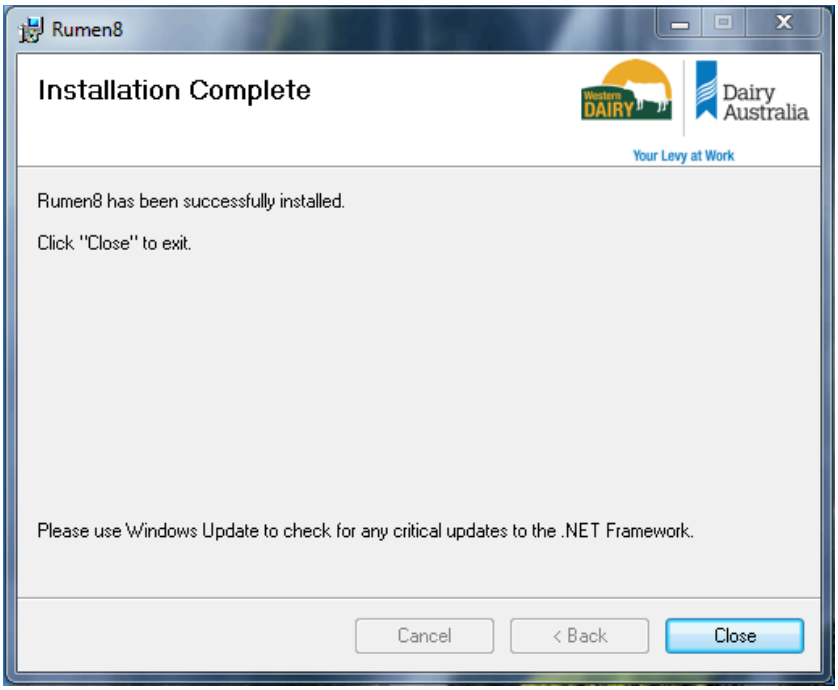
Click on the 'Next' button to confirm installation.

Figure 9. The confirm installation window.



Click on the 'Next' button to go ahead with the installation of Rumen8.

Figure 10. The installation complete window.

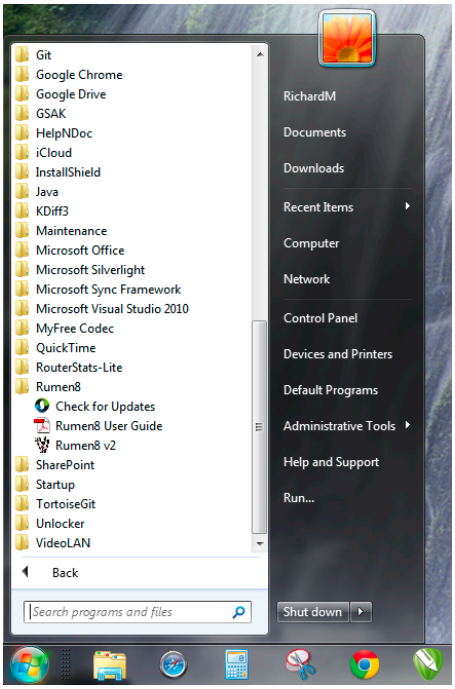


Installation of Rumen8 is complete, click on the 'Close' button to exit the installer.

Starting Rumen8 for the first time

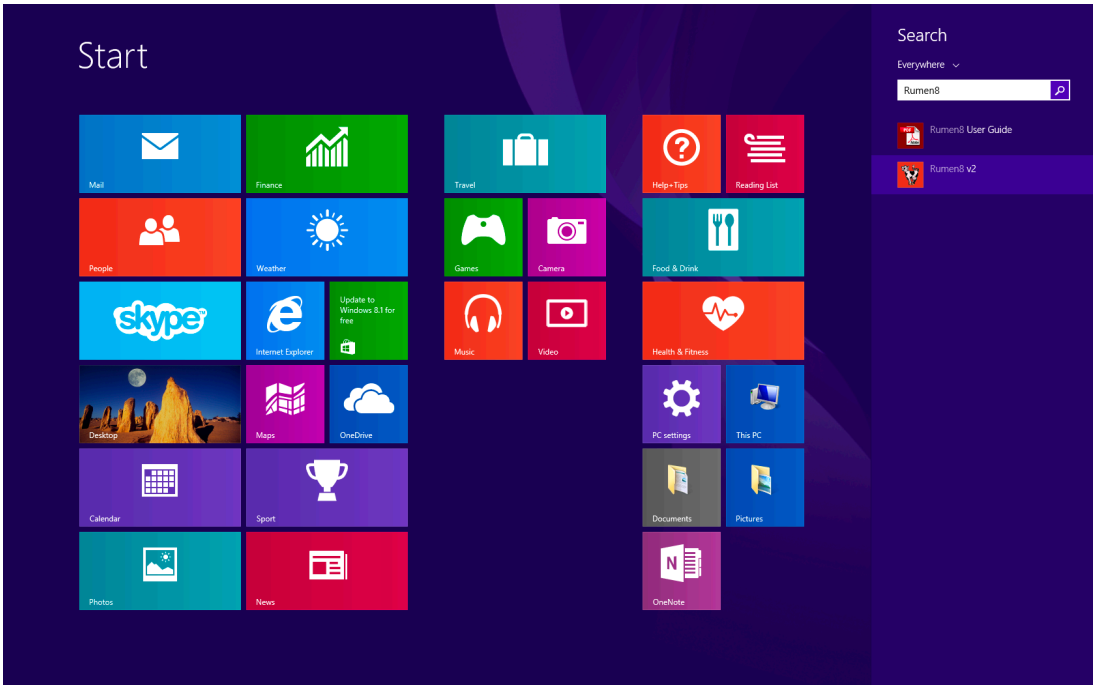
Rumen8 can be started from the Start Menu of Windows XP, Vista or 7 in the 'All programs' list. The Windows 7 start menu is shown in the figure below. Options to Pin the Rumen8 icon to the Taskbar, Start menu or Send a shortcut to the Desktop can be accessed by right clicking on the Rumen8 icon.

Figure 11. Starting Rumen8 under Window 7.



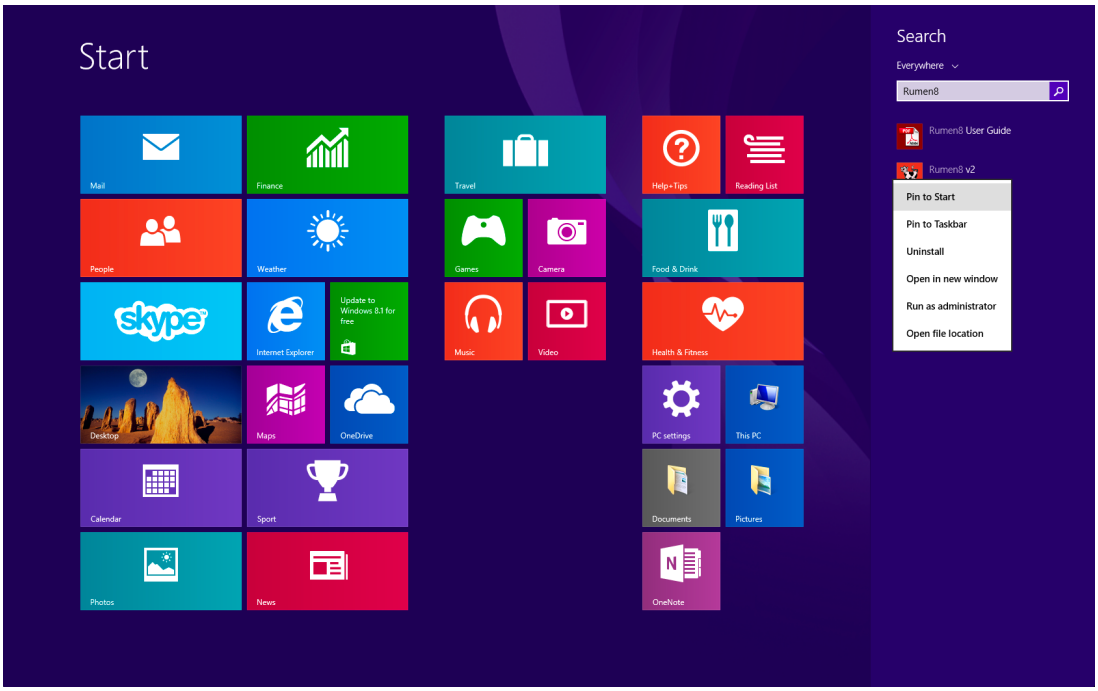
For Windows 8 users type 'Rumen8' while in the Modern tiled interface and options to install, run and read the Rumen8 User Guide will appear in the search window down the right of the screen.

Figure 12. Starting Rumen8 for the first time in Windows 8.



To pin an icon to the tile interface and the Desktop so you can start Rumen8 without typing its name in the future, right click on the Rumen8 icon. Select 'Pin to Start' and/or 'Pin to Taskbar' to place the Rumen8 icon in these locations.

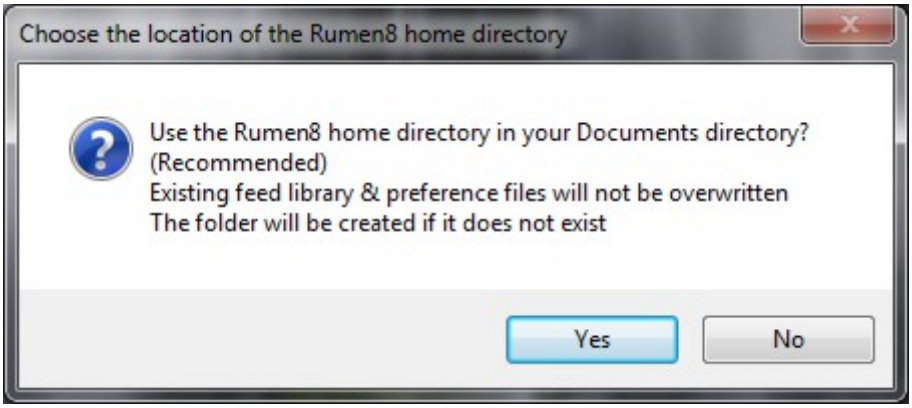
Figure 13. Pin the Rumen8 icon to the Start bar and Taskbar.



Finally, left click on the Rumen8 icon to start the application.

When Rumen8 starts for the first time it will ask you where to create a Rumen8 folder into which will be placed a Libraries folder with the feed library, preferences, milk prices and cow files.

Figure 14. Choose the location of the Rumen8 folder.


Choose the location of the Rumen8 home directory
Use the Rumen8 home directory in your Documents directory?
(Recommended)
Existing feed library & preference files will not be overwritten
The folder will be created if it does not exist
Yes
No

Your Documents folder is the recommended location as this is easy to access and is more likely to get backed up. If you are happy with the default location click the 'Yes' button but if you would like another location for the Rumen8 folder click 'No'. This will take you to a folder browser where you may specify the location yourself.

Rumen8 will then create a folder called 'Rumen8' at the chosen location and within it another folder called 'Libraries'. In this folder will be copied the feed library, preferences, milk prices and cow files used by the application.

If a folder called 'Rumen8' already exists in the location you have chosen it will be used and no files will be deleted. If a 'Libraries' folder already exists within the Rumen8 folder it will also be used. If you already have the library files from a previous installation in the Libraries directory they will be left untouched and the defaults not copied from the application folder. In this way you can remove and reinstall Rumen8 manually and your feed library and settings will remain.

The Rumen8 folder is the recommended location for your saved diet files.

The main Rumen8 window will now open ready for use.

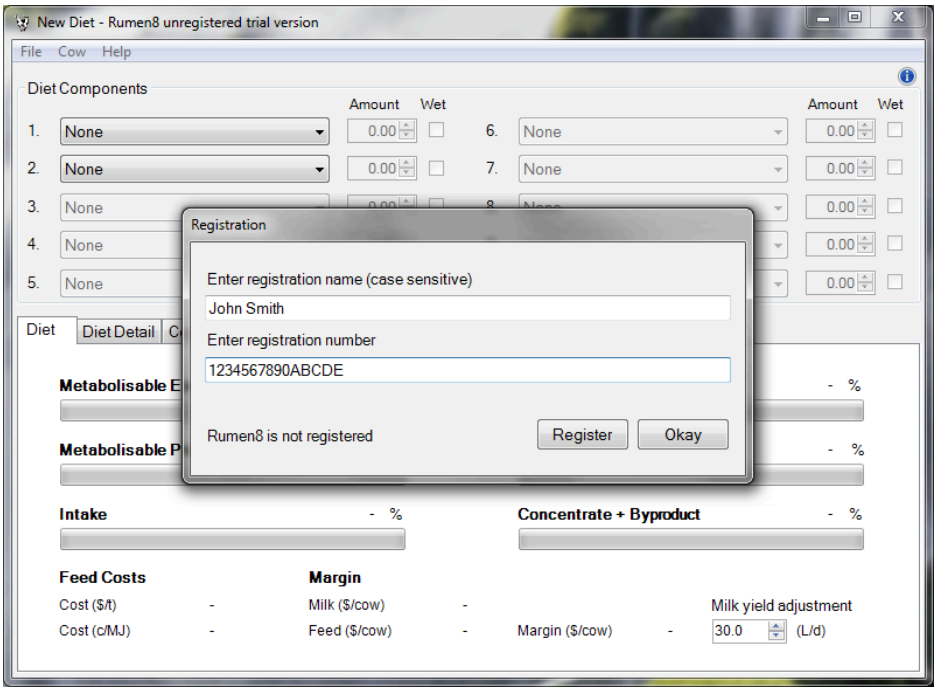
Registering Rumen8

When Rumen8 is run for the first time it will start in trial mode. This allows you to use all the functions of the application but you are restricted to diets with only two components. To get full access to all the diet components please register, which is free. We ask you to register so we have an estimate of the number of people using the application. This information will be used for future funding applications for further development. By not registering or sharing your registration name and number you are reducing the chance of future improvements to Rumen8.

To register send an email to support@rumen8.com.au specifying the name you would like to register and the email address you would like to be contacted on if it is different to the one used to send the email. Your email will only be used to contact you for registration purposes and matters concerning Rumen8 in the future. It will not be passed on to any other person or group. You should receive a registration email within 48 hours containing a registration code that is linked to your name.

If you go to the Registration option under the Help menu you can enter your name and registration number exactly as specified in the email from Rumen8 support. Click the 'Register' button and all the feed components will become available.

Figure 15. Entering registration details.



Removing your Rumen8 registration

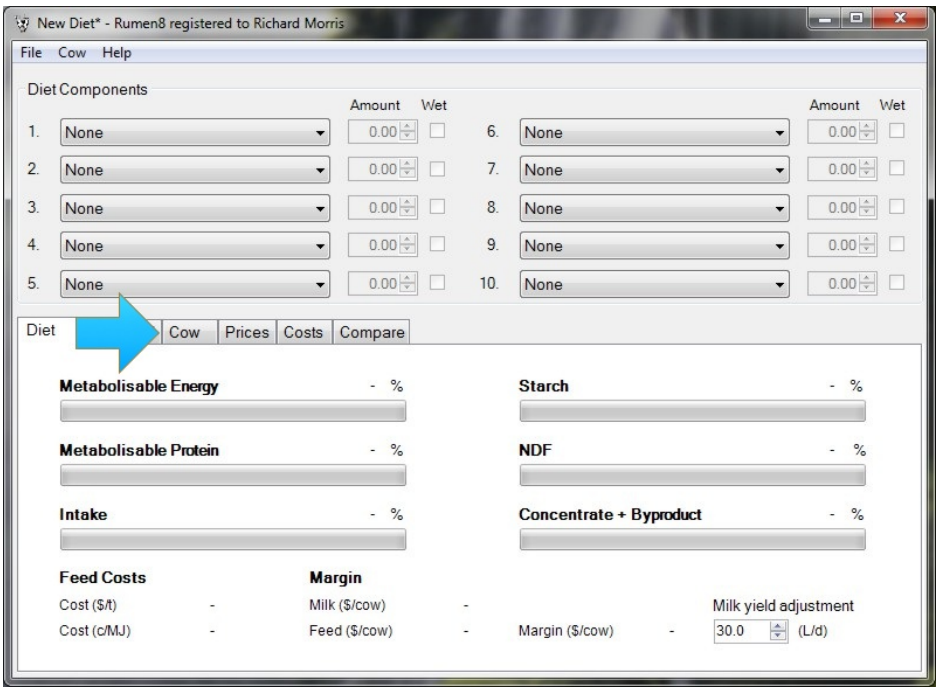
If you plan to give you computer to someone else, before uninstalling Rumen8 go to the Registration option under the Help menu and click the 'Deregister' button. Your name and registration code will be removed from the machine and Rumen8 will revert to trial mode.

Quick Start Guide

Start Rumen8 and the main screen will open. If you are unsure what something within Rumen8 is, hover your mouse over it and for most objects a tooltip will appear providing a more detailed explanation.

Click on the 'Cow' tab to show the cow description. The 'Cow' tab is highlighted with a blue arrow in the figure below.

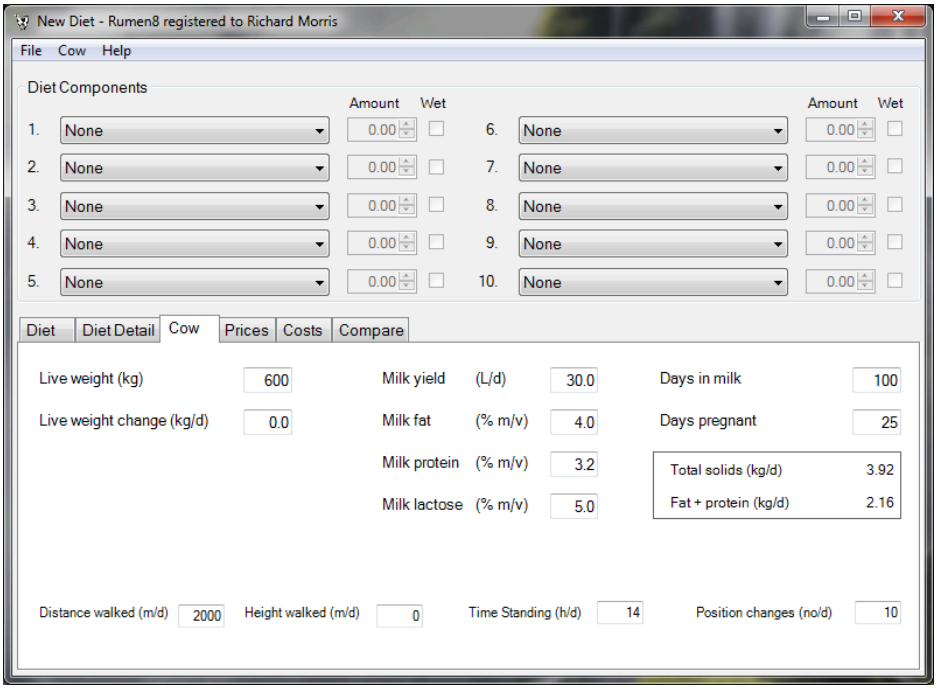
Figure 16. Selecting the Cow tab.



Describe a cow

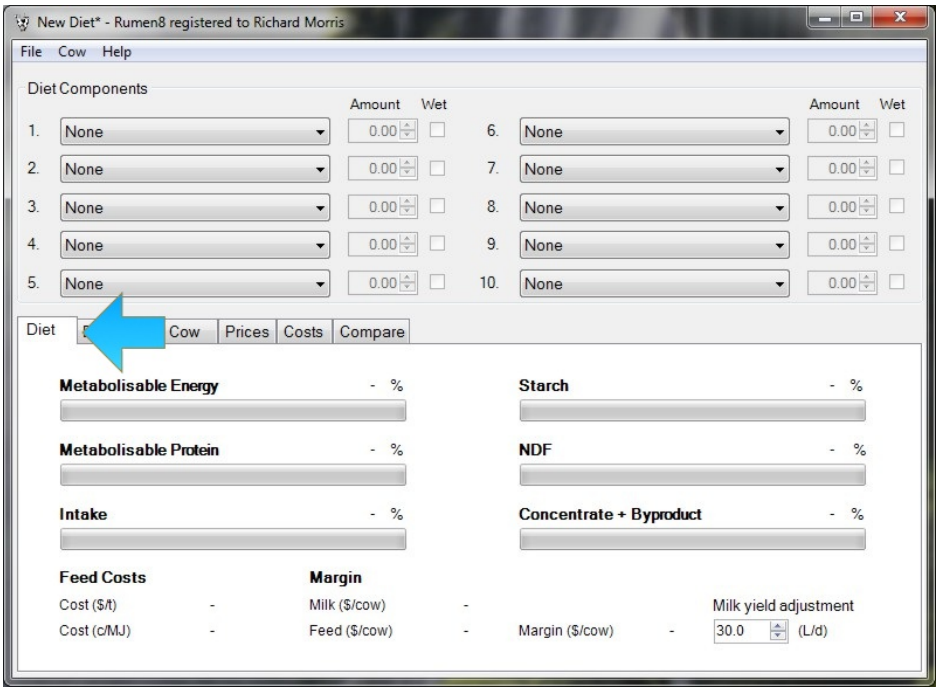
Using the entry boxes describe the cow you wish to feed, or the average cow that represents your herd. You can adjust liveweight, growth rate, milk yield and components, stage of lactation and number of days pregnant. Less important parameters let you adjust the activity level of the cow if you have a large or hilly farm.

Figure 17. The Cow tab.



Leave the defaults alone for now and click on the Diet tab so we can see changes to the cows diet as we add feeds. The 'Diet' tab is highlighted with a blue arrow in the figure below.

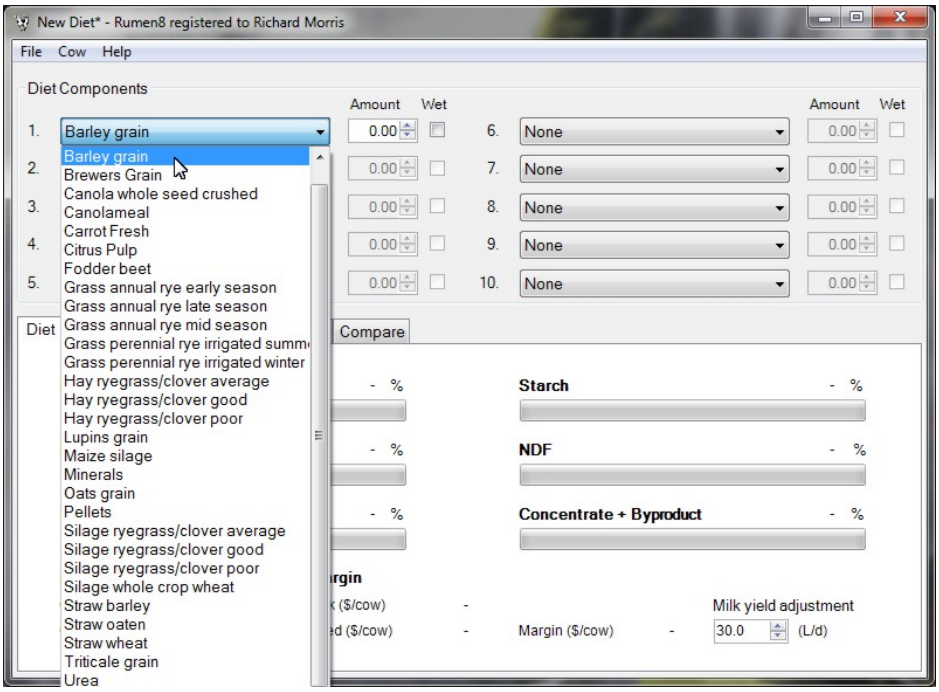
Figure 18. The Diet tab.



Enter a diet

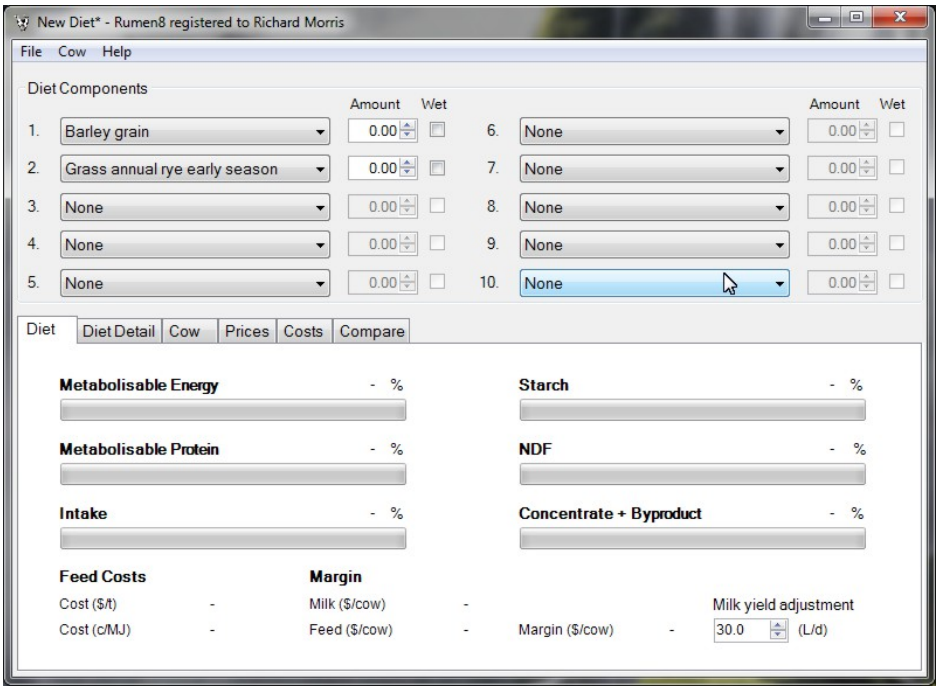
Ten diet components to make up a cow diet can be entered using the drop down lists in the top of the window. Click on component 1 and select 'Barley grain' as our first feed in the diet.

Figure 19. Selecting a feed in the first diet component menu.



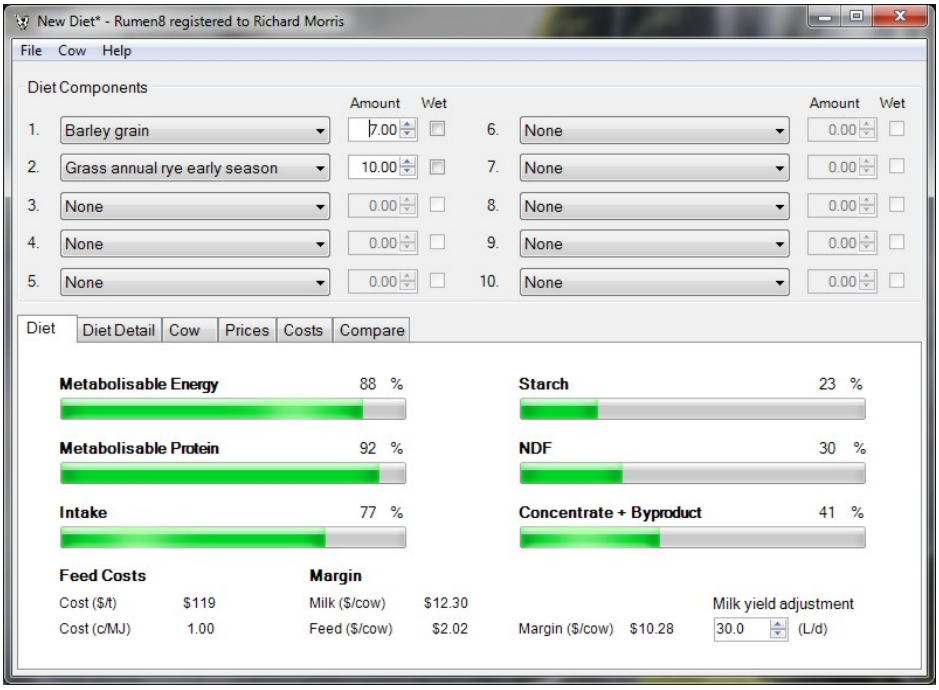
Move down to the component 2 drop down list and select ‘Annual ryegrass early season’. The window should now look like the figure below.

Figure 20. Two diet components chosen.



Finally, let's feed our cow. Increase the amount of barley grain and ryegrass fed using the 'Amount' entry box to the right of their name. Enter 7 kilograms of barley grain and 10 kilograms of ryegrass. The window should now look similar to the figure below.

Figure 21. Feeding our cow.

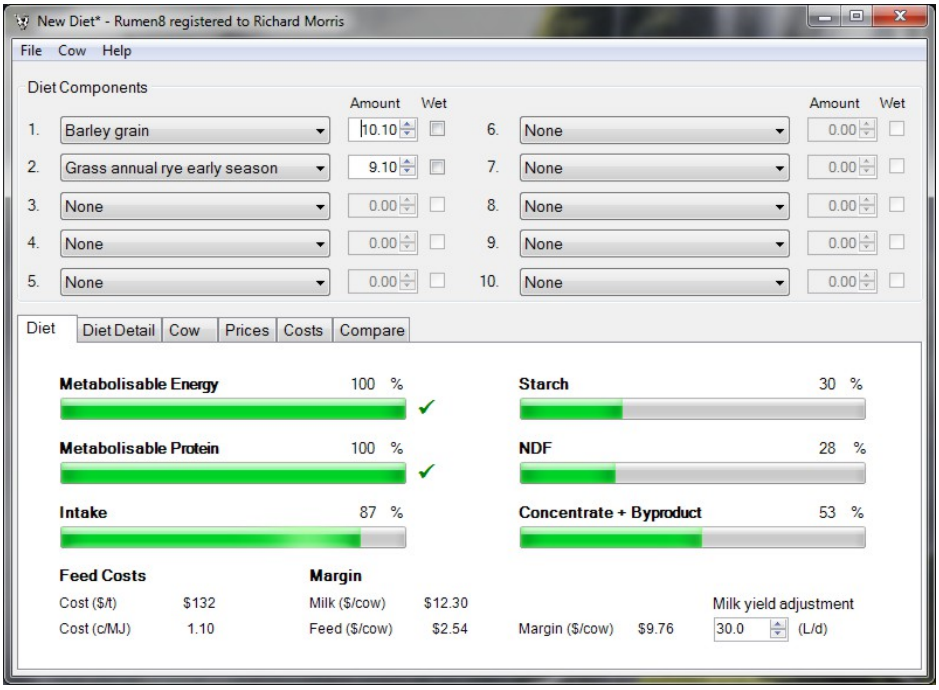


Evaluate a diet

The 'Diet' tab shows six of the parameters you need to consider when formulating a diet for dairy cows. For this example we will consider the first three. With 7 kg of barley grain and 10 kg of ryegrass we can see there is insufficient metabolisible energy (88% of the ME requirement) and protein (92% or the MP requirement) in this diet for the cow and level of production we entered on the 'Cow' tab. However, the cows' intake potential is only 77% so she can physically eat more food if it is presented to her.

Increase the amount of barley grain to 10.1 kg and decrease the ryegrass to 9.1 kg. Now you will see both ME and MP are at 100% of the cow requirement and intake potential is still below 100% so she can eat this amount of feed. Your screen should look like the figure below.

Figure 22. A diet balanced for ME and MP.



This brings us to a very important point that is true of all nutrition models. The application tells us we have a diet that meets the requirements of our cow, but no nutritionist would ever recommend this particular diet. The starch content is too high, NDF too low and proportion of the diet that is highly digestible concentrate or byproduct is a little too high for comfort. That is before we consider the lost production from feeding our cows less than they can eat.

Rumen8 is a tool that will assist someone with nutritional knowledge to better and more cost effectively feed their cows, but in the hands of someone without that knowledge it can create diets that appear balanced on paper but may decrease cow performance or adversely affect their health.

We recommend Rumen8 is used with your nutritionist and depending on your level of knowledge, used to adjust diets between their visits.

This diet is now balanced for energy and protein and the cow can physically eat the feed when it is presented to her. This demonstrates the process to go through when designing a diet for your cows, and you can now further refine the diet by looking at other important parameters such as starch and NDF content. More information about the current diet is presented in the 'Diet detail' tab.

The remaining tabs allow you to change milk payment (Prices tab), the cost of the feeds in the current diet (Costs tab) and save and compare related diets before choosing the best one (Compare tab). How to use these functions is detailed in 'The Main Screens' section of this document.

The problem of measuring pasture intake

It all sounds simple, choose the feeds your cows are getting, enter the quantities you provide and balance the diet. Easy, but what about grazed pasture? Accurately measuring how much

grazed pasture a cow eats is very expensive and time consuming so is not practical on farm. To solve this problem we 'back calculate' how much pasture they must be eating by subtraction of all the feeds you do know. It is easier than it sounds.

1. Enter the values that describe the average cow in your herd on the Cow tab. Include the current milk production and yield. Rumen8 will calculate the metabolisible energy needed for the cow and this is displayed on the Diet and Diet Detail tabs.
2. Add all the supplementary feed provided to the cows to the Diet Components drop down lists. This includes grain fed in the dairy and forages in the paddock. Everything except grazed pasture.
3. Rumen8 now calculates the metabolisible energy provided by the supplements and the difference between this and the cow's requirement must be supplied by grazed pasture. This is shown on the Diet Detail tab as the Balance under the Metabolisible energy section and the remaining percentage of the metabolisible energy bar on the Diet tab.
4. Select a suitable pasture for your farm and time of year and as the next diet component. Increase the quantity of this until the metabolisible energy provided by the diet is the same as the requirement of the cow.

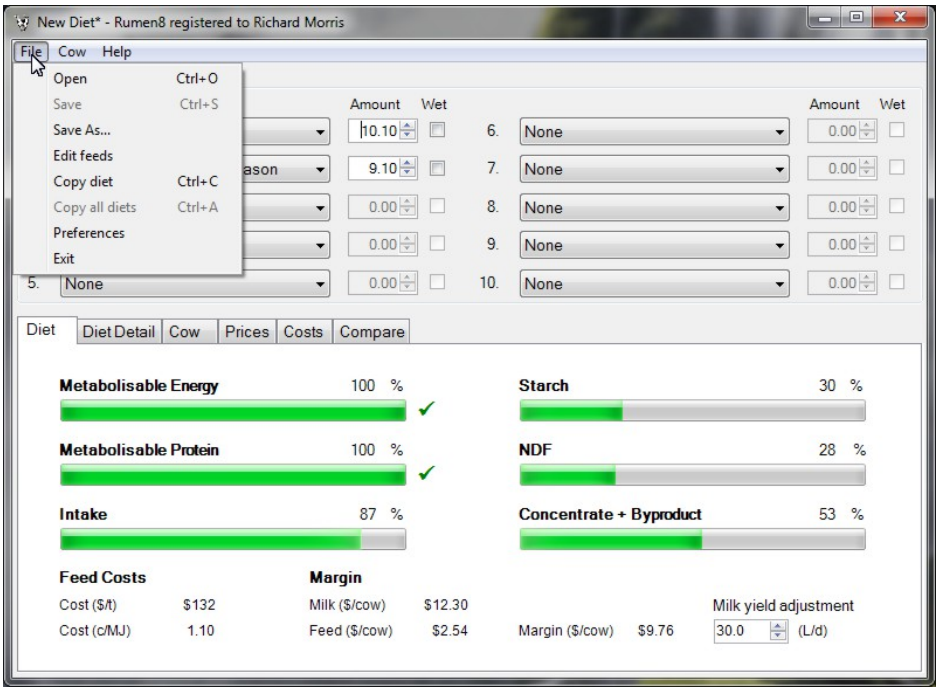
You now have the diet that reflects the current situation with an estimate of the amount of pasture each cow is eating. With this information you can explore alternative diets that include pasture assuming you will maintain the amount of pasture on offer for the herd in the future.

Menu Commands

The menu is along the top of the main window and has three choices, File, Cow and Help.

File menu

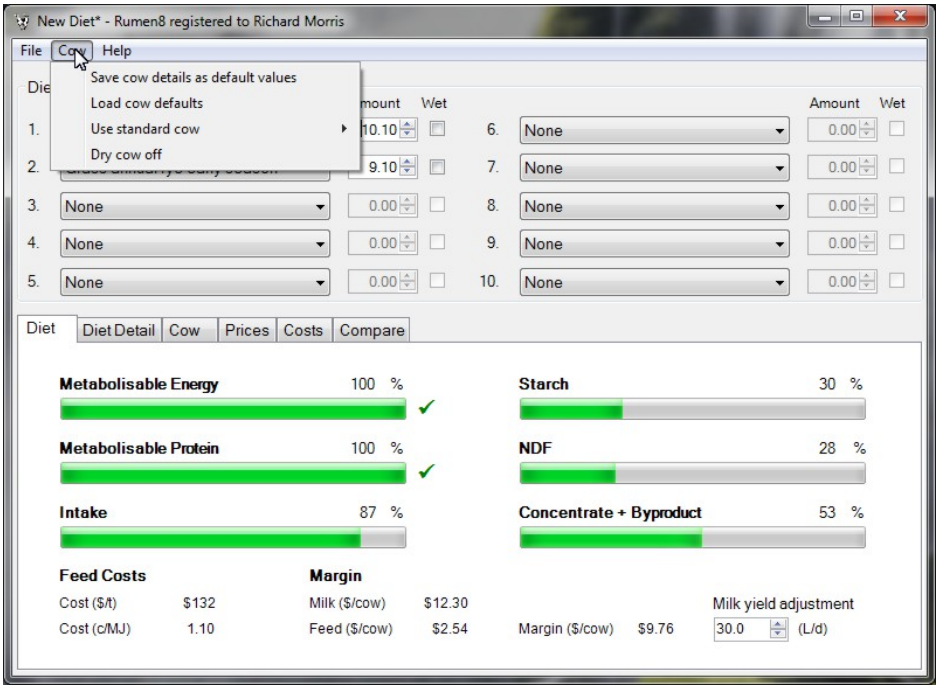
Figure 23. The File menu.



Open	Allows you to load a previously saved diet.
Save	Save the current diet. Only available if the diet has been previously saved and named using the 'Save As' menu.
Save As	Name and then save the current diet. If changes to the current diet have not been saved an * will appear next to the diet name in the title bar.
Edit feeds	Opens the Feed Editor to change feed parameters and the feeds available in the component drop down lists. A more detailed explanation is given in the Feed Editor section.
Copy diet	Copy the current diet to the clipboard for later pasting into Excel or Word for example.
Copy all diets	Copy the current diet and the three stored diets to the clipboard.
Preferences	Open the preferences window to change the Rumen8 settings. A more detailed explanation is given in the Preferences section.
Exit	Close Rumen8. You will be prompted to save any unsaved feeds, milk prices or diets.

Cow menu

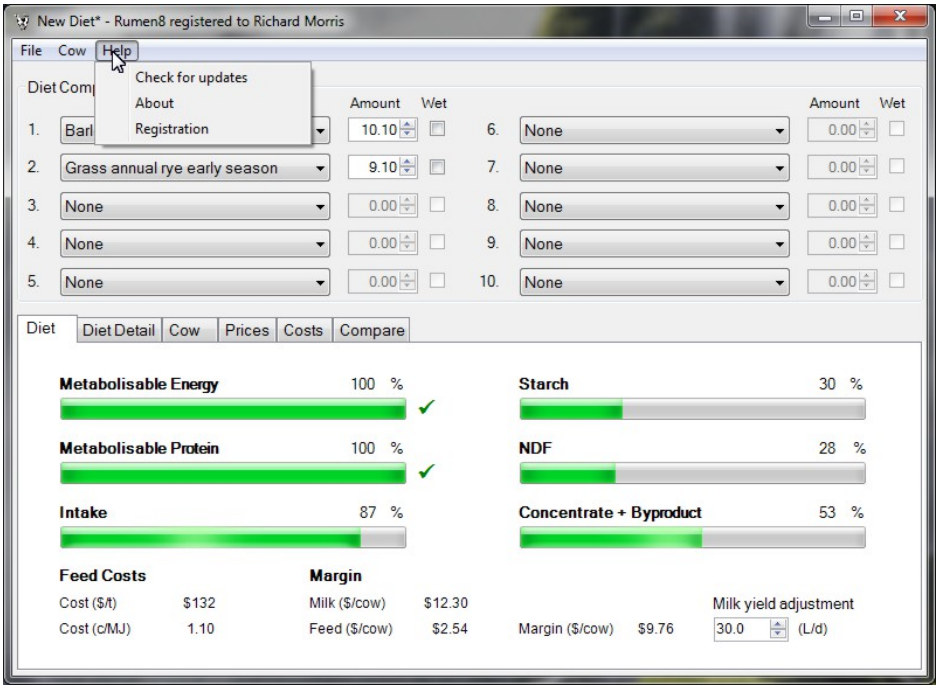
Figure 24. The Cow menu.



Save cow details as default values	Save the current cow as the default cow that will be loaded each time Rumen8 starts.
Load cow defaults	Replace the current cow with the default cow.
Use standard cow	Replace the current cow with a pre-defined generic cow in early, mid or late lactation for total lactation production of 5000, 6000, 7000 or 8000 litres. These cow definitions should only be used for general analyses. For on-farm use actual milk production and composition for the herd of interest should be used.
Dry cow off	Change the parameters for the current cow as if it had been dried off and was mid-way through a 65-day dry period.

Help menu

Figure 25. The Help menu.



Check for updates	Check to see if a newer version of Rumen8 is available. This can only be done if your computer is connected to the Internet.
About	Display information about Rumen8 such as the version number, website address and email for support.
Registration	Enter your registration number and name here to unlock all ten of the diet components.

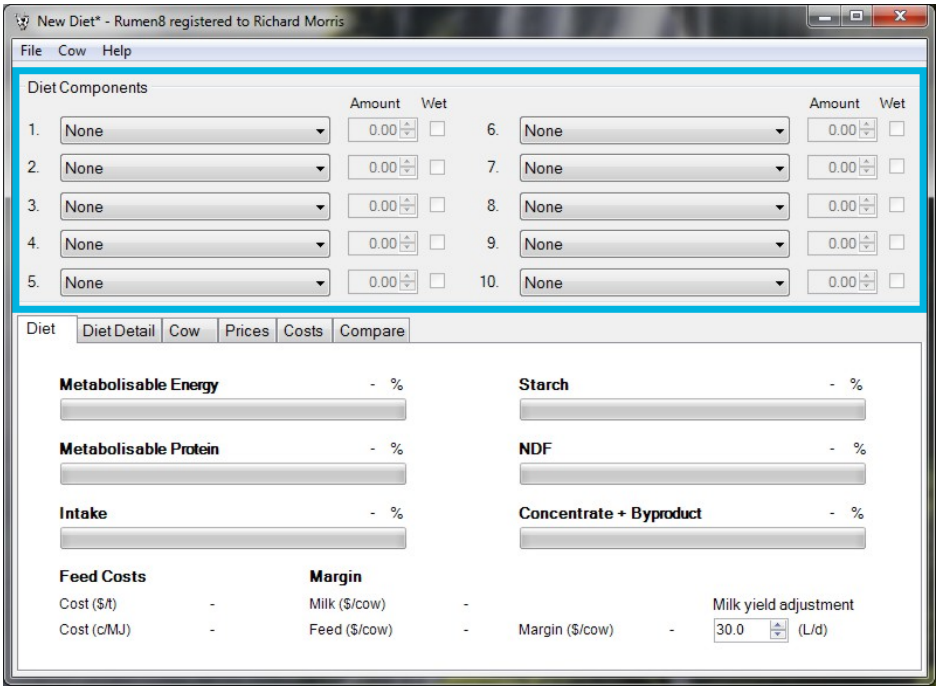
The Main Screens

This section will describe the main parts of the Rumen8 window and how you use them.

Diet Components

The top section of the main window is where you add feeds to your diet and specify the quantity fed each day. In the figure below it is highlighted within a blue rectangle.

Figure 26. The Diet Components section of the main window.

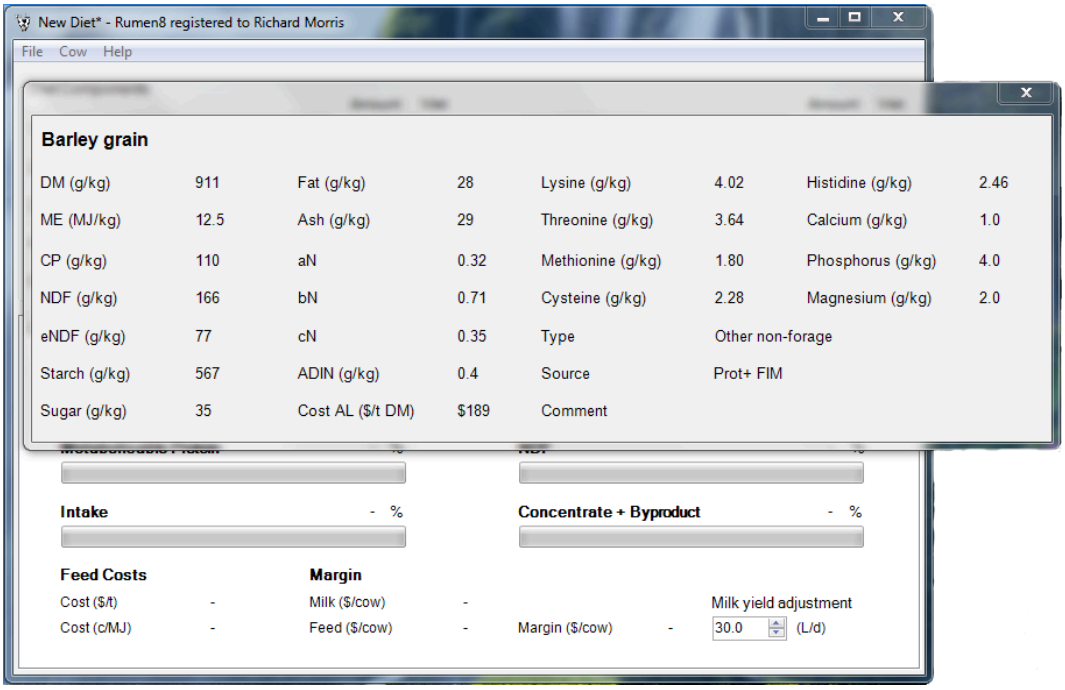


Clicking on the down arrowhead to the right of the drop down lists you can choose any of the feeds available from the feed library. Once a feed has been selected the 'Amount' entry box becomes active and you can either type the kilograms to be fed in directly or click on the up and down buttons to vary the existing amount.

By default the quantity of feed is expressed on a dry matter basis but if your weight is a fresh or wet weight click on the 'Wet' checkbox to the right of the feed amount. This tells Rumen8 your feed weight is 'as fed' to the cow and it will use the dry matter content in the feed library to convert this to dry matter before it is used in calculations.

Up to ten feeds can be added to a diet. To see the details of a selected feed click on the component number and the detail window will open. Click anywhere within the body of the window or the close button at the top right of the window to close the detail window.

Figure 27. The Diet Component detail window.

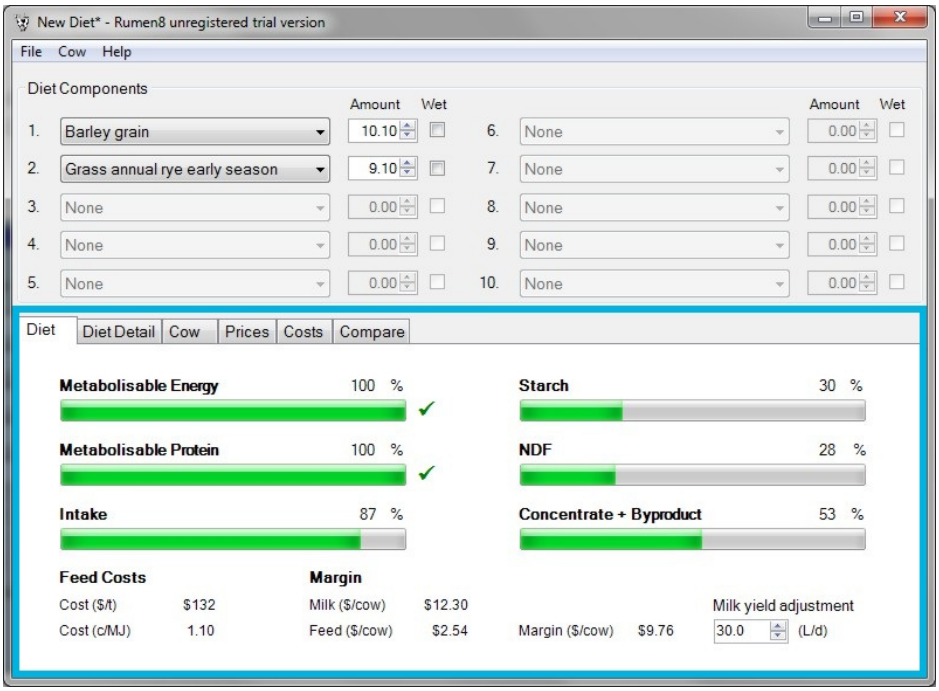

New Diet* - Rumen8 registered to Richard Morris
File Cow Help
Barley grain
DM (g/kg) 911 Fat (g/kg) 28 Lysine (g/kg) 4.02 Histidine (g/kg) 2.46
ME (MJ/kg) 12.5 Ash (g/kg) 29 Threonine (g/kg) 3.64 Calcium (g/kg) 1.0
CP (g/kg) 110 aN 0.32 Methionine (g/kg) 1.80 Phosphorus (g/kg) 4.0
NDF (g/kg) 166 bN 0.71 Cysteine (g/kg) 2.28 Magnesium (g/kg) 2.0
eNDF (g/kg) 77 cN 0.35 Type Other non-forage
Starch (g/kg) 567 ADIN (g/kg) 0.4 Source Prot+ FIM
Sugar (g/kg) 35 Cost AL ($/t DM) $189 Comment
Intake - %
Concentrate + Byproduct - %
Feed Costs
Cost ($/t) -
Cost (c/MJ) -
Margin
Milk ($/cow) -
Feed ($/cow) -
Margin ($/cow) -
Milk yield adjustment
30.0 (L/d)

As feeds are added or quantities are adjusted Rumen8 updates the diet performance in the lower half of the window.

Diet

The first tab in the bottom section of the main window provides an overview of the current diet performance. It is highlighted within a blue rectangle in the figure below.

Figure 28. The Diet tab.



The Diet tab has six horizontal bars representing the energy, protein, intake, starch, NDF, concentrate + byproduct in the diet. Below these are the cost of the diet, income received for the milk produced and the resulting margin (income – costs). Finally, milk yield can be fine tuned at the bottom right of the tab.

Metabolisable energy (ME) and protein (MP) are expressed as a percentage of the cow's requirement so a balanced diet should have both of these parameters around 100%. When the cow's requirement is not being met the percentage will be black. When the level of ME or MP meets the cow's requirement a green tick will appear at the end of the bar. If excess ME or MP is provided by the diet the percentage will turn red and a red plus will appear at the end of the bar.

The intake bar shows the percentage of the cow's maximum intake the current diet represents. When the cow is eating to potential a green tick will appear at the end of the bar. If the diet contains too much feed for the cow to eat the percentage will turn red and a red plus will appear at the end of the bar.

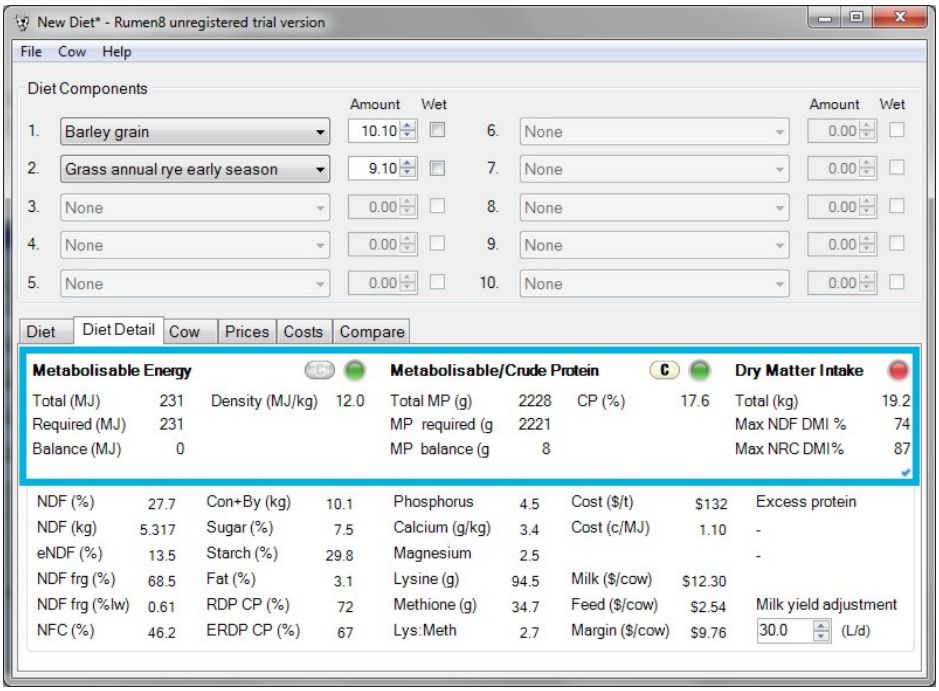
The starch and NDF bars show the percentage of the diet made up of these components. The final bar shows how much of the diet is highly digestible concentrate or byproduct.

How close to 100% ME, MP or intake have to be to get a green tick is set in the preferences.

Diet Detail

The 'Diet Detail' tab is used in a similar way to the 'Diet' tab, but contains much more information about the diet performance.

Figure 29. Energy, protein and intake on the Diet Detail tab.



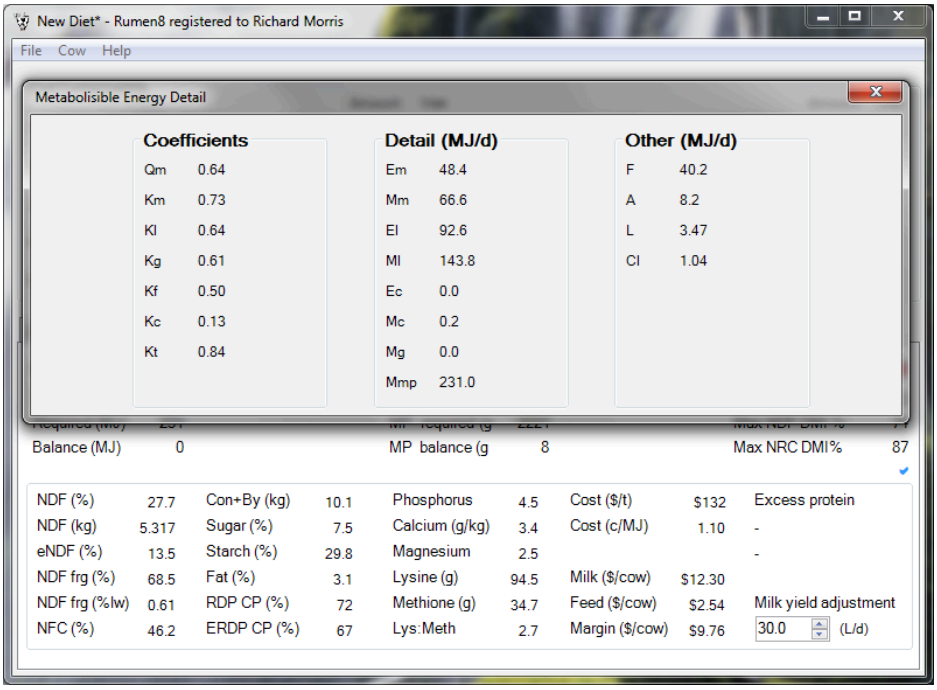
The top part of the tab is divided into three sections covering energy, protein and intake.

Energy

This section shows the total ME provided by the diet, required by the cow and the subsequent balance. To the right is the energy density of the diet.

Two lights are present in the top row of the energy section. The oval 'C' light is lit when Rumen8 is adding a constant amount to the cows ME requirement. This is a preferences setting. The 'traffic light' to the right is red when ME from the diet is insufficient, green when it meets the cows requirement and blue when it exceeds the cows needs. Clicking on the title 'Metabolisible Energy' will bring up the detail window that provides more information about the energy model used by Rumen8. Click anywhere within the body of the window or the close button at the top right of the window to close the detail window.

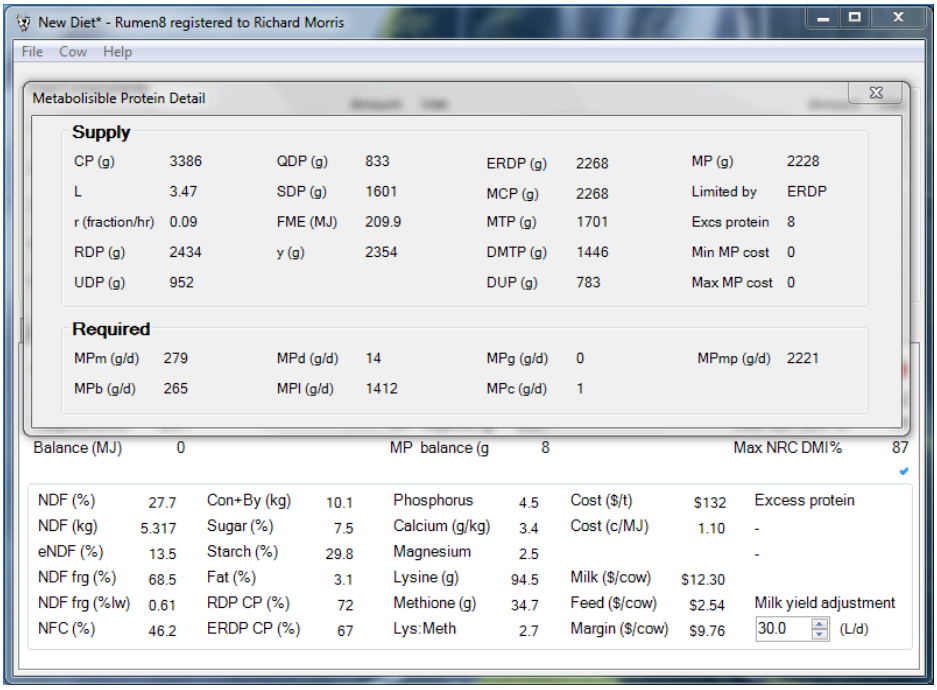
Figure 30. The Metabolisible Energy detail window.



Protein

This section shows the total MP provided by the diet, required by the cow and the subsequent balance. To the right is the diet's crude protein content. Crude protein is not used by Rumen8 and is only provided for reference. Two lights are present in the top row of the protein section. The oval 'C' light is lit when Rumen8 is applying a correction factor to the cows MP requirement. This is a preferences setting. The 'traffic light' to the right is red when MP from the diet is insufficient, green when it meets the cow's requirement and blue when it exceeds the cows needs. Clicking on the title 'Metabolisible/Crude Protein' will bring up the detail window that provides more information about the protein model used by Rumen8. Click anywhere within the body of the window or the close button at the top right of the window to close the detail window.

Figure 31. The Metabolisible Protein detail window.

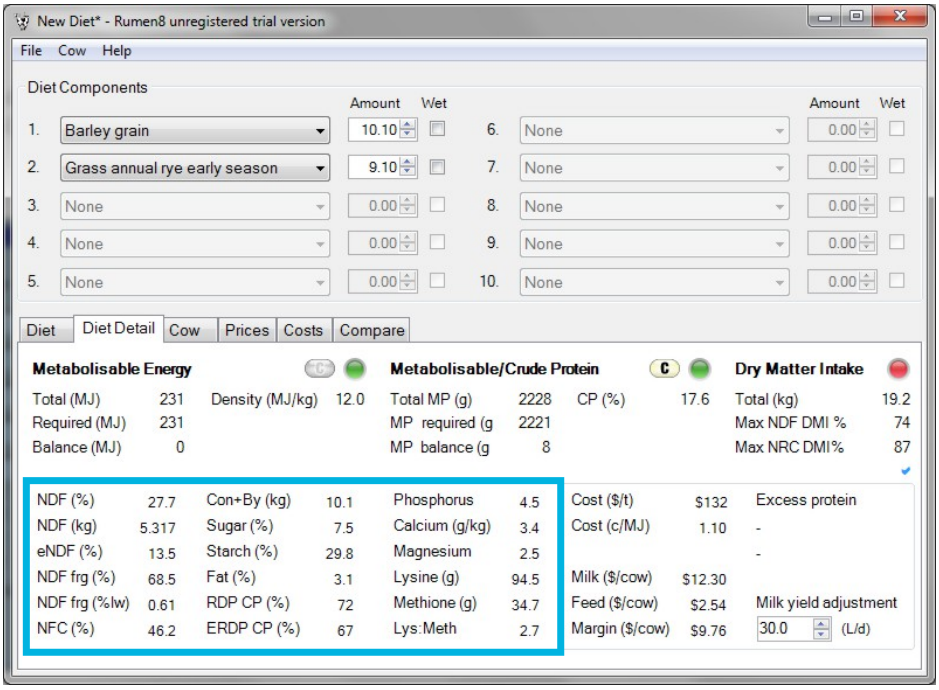

New Diet* - Rumen8 registered to Richard Morris
File Cow Help
Metabolisible Protein Detail
Supply
CP (g) 3386 QDP (g) 833 ERDP (g) 2268 MP (g) 2228
L 3.47 SDP (g) 1601 MCP (g) 2268 Limited by ERDP
r (fraction/hr) 0.09 FME (MJ) 209.9 MTP (g) 1701 Excs protein 8
RDP (g) 2434 y (g) 2354 DMTP (g) 1446 Min MP cost 0
UDP (g) 952 DUP (g) 783 Max MP cost 0
Required
MPm (g/d) 279 MPd (g/d) 14 MPg (g/d) 0 MPmp (g/d) 2221
MPb (g/d) 265 MPl (g/d) 1412 MPc (g/d) 1
Balance (MJ) 0
MP balance (g 8
Max NRC DMI% 87
NDF (%) 27.7 Con+By (kg) 10.1 Phosphorus 4.5 Cost ($/t) $132 Excess protein
NDF (kg) 5.317 Sugar (%) 7.5 Calcium (g/kg) 3.4 Cost (c/MJ) 1.10 -
eNDF (%) 13.5 Starch (%) 29.8 Magnesium 2.5 -
NDF frg (%) 68.5 Fat (%) 3.1 Lysine (g) 94.5 Milk ($/cow) $12.30
NDF frg (%lw) 0.61 RDP CP (%) 72 Methione (g) 34.7 Feed ($/cow) $2.54 Milk yield adjustment
NFC (%) 46.2 ERDP CP (%) 67 Lys:Meth 2.7 Margin ($/cow) $9.76 30.0 (L/d)

Intake

The intake section shows the dry weight of the current diet and the percentage of maximum intake this weight represents for two methods of calculating intake potential. It is recommended you refer to the NRC DMI%, as this is more reliable than determining intake potential by calculating NDF intake as a percentage of liveweight. The 'traffic light' is red when the diet is less than the cow can eat, green when it is the maximum the cow can eat and blue when it exceeds the cow's ability to eat it.

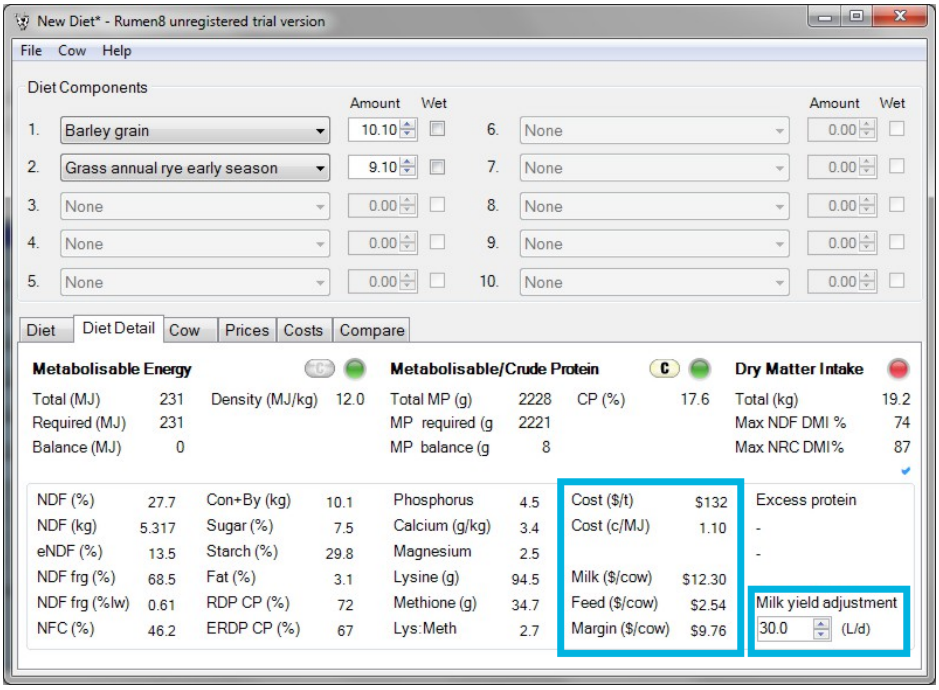
The blue tick below the 'Max NRC DMI%' value appears when the 5% safety margin for ME and MP is turned on in the preferences. The sensitivity of the 'traffic lights' can be adjusted in the preferences.

Figure 32. Diet parameters on the Diet Detail tab.



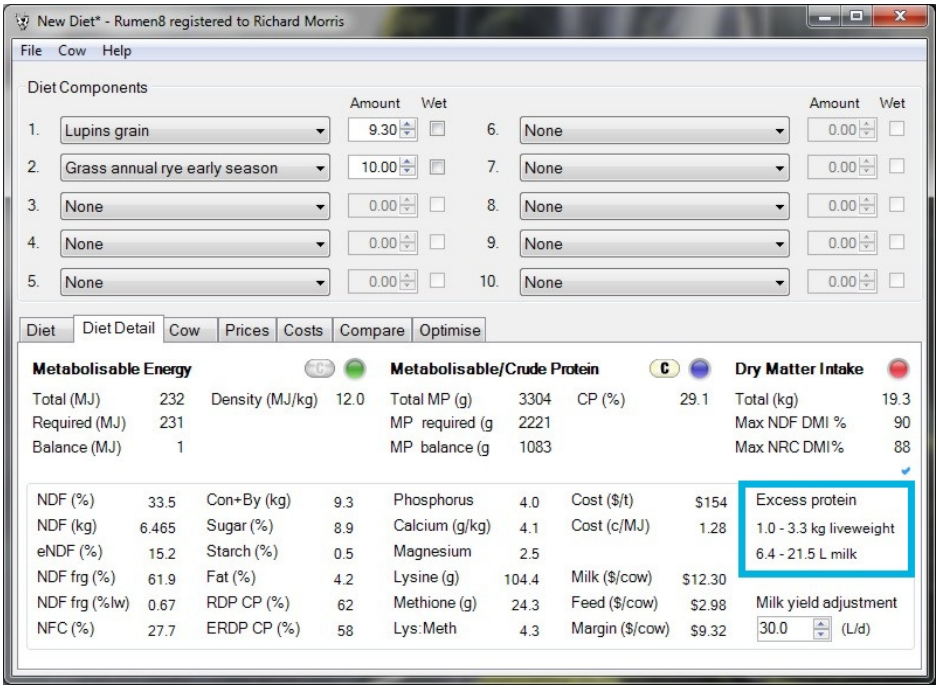
The first three columns of the bottom section of the Diet detail tab reports a range of diet parameters for the current diet. These cover things like NDF, starch and sugar through to mineral content and some of the important amino acids. If you are unsure what one of the abbreviations means hover your mouse over the text and a tooltip will appear with a more detailed explanation.

Figure 33. Costs, margin and milk yield adjustment on the Diet Detail tab.



Alongside these in the fourth column are the cost of the diet, income received for the milk produced and the resulting margin (income – costs). Milk yield for the cow can be fine-tuned at the bottom right of the tab.

Figure 34. The cost of a diet with excess protein in the Diet Detail tab.

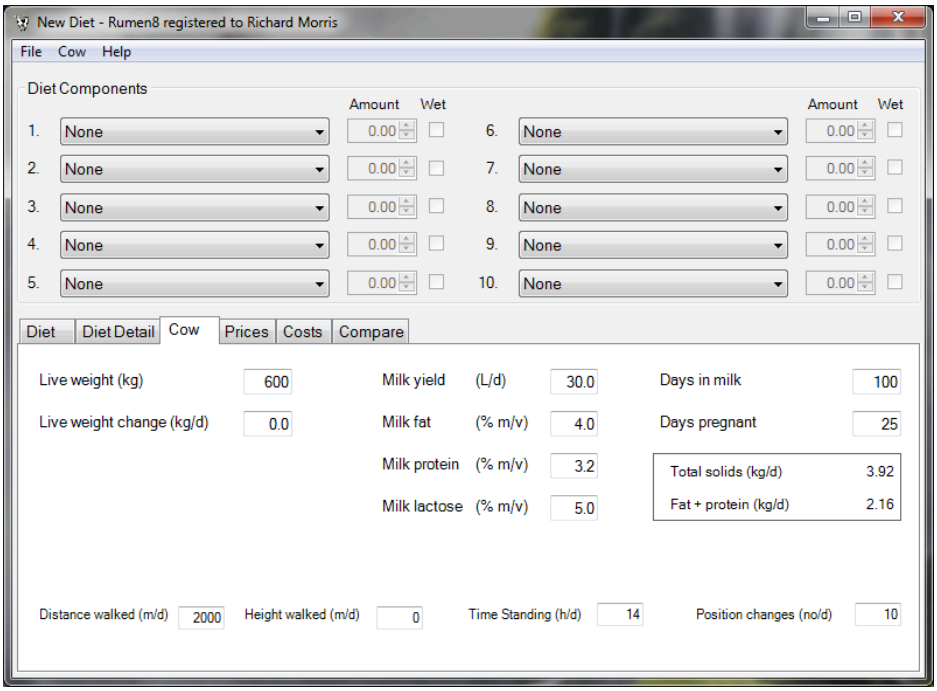


The 'Excess protein' section shows the effect of having too much protein in the diet. There is a metabolic cost to remove the additional protein and this is expressed as forgone milk production or liveweight growth. The calculation of this can be adjusted in the preferences.

Cow

The 'Cow' tab is used to describe the cow, or the herd average, that we are designing the diet for.

Figure 35. The Cow tab.



Using the entry boxes to adjust liveweight, growth rate, milk yield and components, stage of lactation and number of days pregnant. The milk yield is expressed as total solids and fat plus protein kilograms per day based on the input milk yield and components.

Less important parameters let you adjust the activity level of the cow if you have a large or hilly farm.

Liveweight

Mean liveweight (kg) of the herd of interest at the time of interest. If unknown, use the following as a guide.

> "North American" Holstein cows are 600-650 kg live weight.
> Australian Friesian cows are 550-600 kg live weight.
> Cross-bred cows 450-500 kg live weight.
> Jersey cows 375-425 kg.
> Heifers 10-20% less than their mature counterparts.

Cows that are weighed on farm are the best guide.

For culled cows that are sold 'over the hooks', dairy cows typically dress out at ~40-45% of live weight. For example a 200-225 kg dressed weight equates to ~500 kg live weight. Note that cull cows are (or should be) older cows, so these may not be representative of the average liveweight of the herd.

Liveweight change

This is the estimate of the amount of liveweight that is being lost across the herd (kg/cow/day). Some typical figures are shown below.

Figure 36. Estimates of liveweight change during a lactation.

Days in milk	0-30	30-60	60-90	90 - 120	120 - 150	150 - 180	180 - 210	210 - 240	240 - 270	270 - 300	Dry period
LWC kg/d	-0.8	-0.6	-0.2	0	0	0.05	0.15	0.3	0.4	0.5	0.1

Days in milk

Days in milk (DIM) is also required to estimate feed intake potential, as stage of lactation influences the amount of feed a cow can consume. Feed intake (kg DM/cow/day) is estimated as per NRC (2001).
Peak dry matter intake (DMI) generally occurs at 80-100 days post calving. Where cows have been exceptionally well prepared for calving and then well fed post calving without any metabolic or health issues peak DMI may occur 60-80 days.
Where cows have had restricted energy intake through this period peak DMI is more likely to be 100-120 days.

Days in milk must be calculated as a **weighted average** for the herd. For example

100 cows @ 100 DIM =	10,000
200 cows @ 280 DIM =	56,000
30 cows @ 350 DIM =	10,500
330 cows	**76,500**

Weighted herd average = 76,500/330 cows = ~230 DIM

Days Pregnant

Affects nutritional requirements, which becomes significant from 140 days onwards. Days Pregnant should be the weighted average of the herd (see above example of DIM)

Milk fat and protein

Ensure you set the correct unit in "preferences": in Australia this is almost always mv%, while in NZ it is mm%. Protein% is true protein (in some countries it is analysed as crude protein which is about 6% higher than true protein). Take the average of the latest 5 days of available factory figures. When estimating production for groups of cows within the milking herd the milk fat and protein %'s are likely to be significantly different to the herd average e.g. early lactation cows at peak production.

Milk lactose

This should be left at 5.0% unless there is actual data available.

Milk yield

(litres or kilograms/cow/day) – if milking numbers are stable this should be the last 5-10 days average. Yield should include all milk, including milk that is being fed to calves and other milk not suitable for human consumption.

Distance walked

This influences the amount of energy required for maintenance.

Cows grazing a large farm (300 Ha) with centrally located dairy will on average walk 3500 metres to and from the dairy plus distance walked while grazing ~1000 metres.

Cows grazing a medium sized farm (150 Ha) with centrally located dairy will on average walk 2500 metres to and from the dairy plus distance walked while grazing ~750 metres.

Cows grazing a smaller sized farm (75 Ha) with centrally located dairy will on average walk 1750 metres to and from the dairy plus distance walked while grazing ~500 metres.

Height walked

This influences the amount of energy required for maintenance. Note that walking 1 'vertical meter' requires the same energy as walking 10 'horizontal meters'.
Flat farms – 0 metres.
Gently undulating farms – 1 - 5 metres.
Rolling farms – 10 - 15 metres.
Steep farms – 30+ metres.

Time standing

Leave at 14 hours unless you have access to a better estimate.

Position changes

The number of times a cow gets up or down during the day. Leave at 10 unless you have access to a better estimate.

Prices

The price of milk is used to calculate milk income and then margin. A total of 24 milk prices can be entered as two sets of 12 prices. One set of twelve prices is entered as payment by volume and the other set as payment for components.

Which set of prices is used by Rumen8 is determined by the 'Payment' box to the right of the tab. Click on the 'Components' button to use the 12 payment prices entered as payment for fat plus protein minus a volume discount, or the 'Volume' button to select the 12 volume prices entered as cents per litre.

Figure 37. The Prices tab as cents per litre.

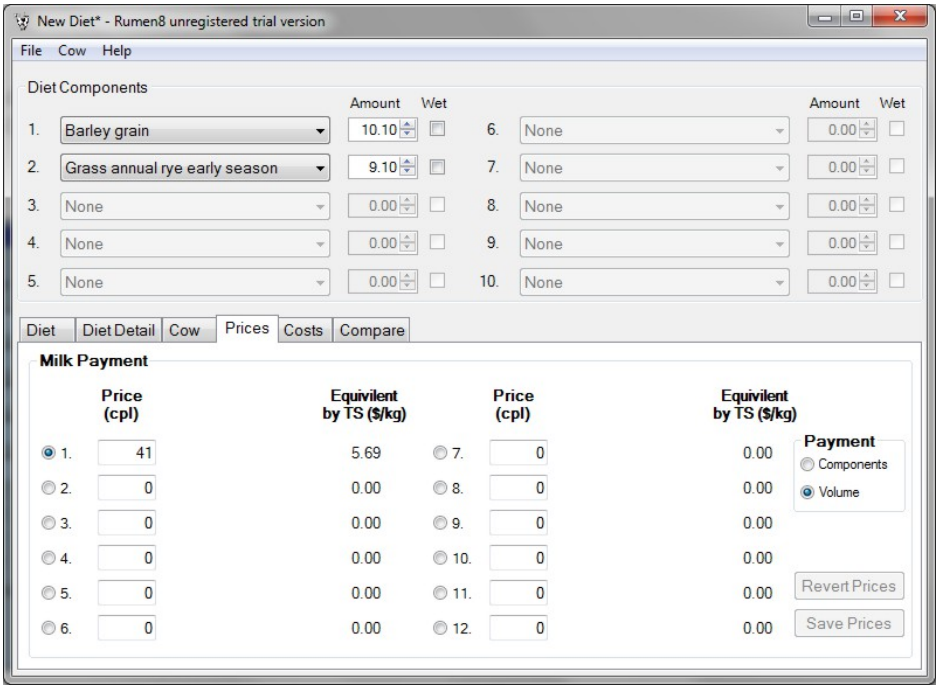
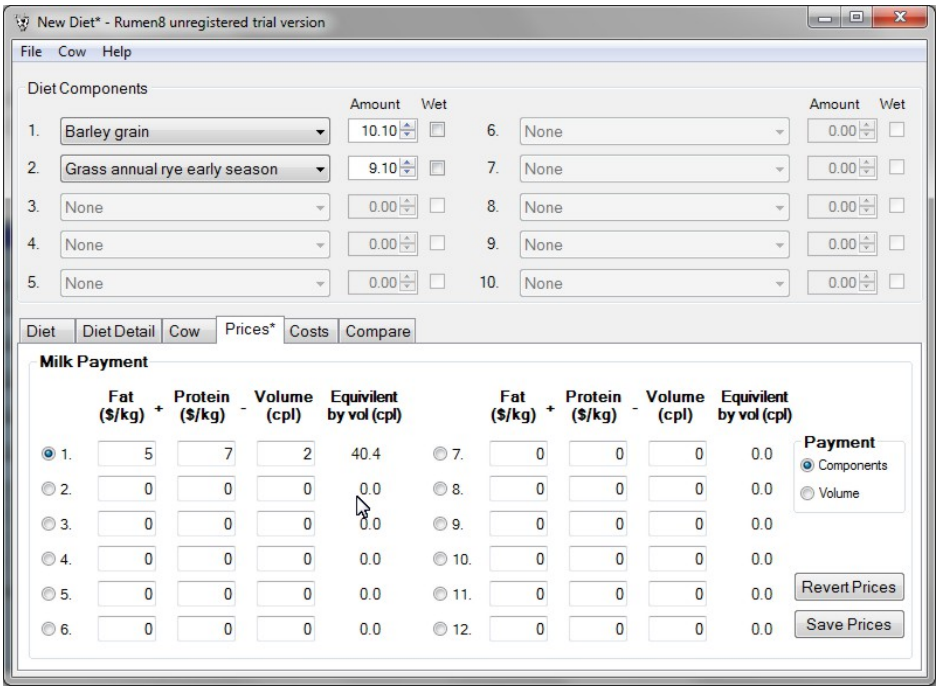


Figure 38. The Prices tab as payment for fat + protein - volume discount.


New Diet* - Rumen8 unregistered trial version
File Cow Help
Diet Components
Amount Wet
1. Barley grain 10.10
2. Grass annual rye early season 9.10
3. None 0.00
4. None 0.00
5. None 0.00
6. None 0.00
7. None 0.00
8. None 0.00
9. None 0.00
10. None 0.00
Diet Diet Detail Cow Prices* Costs Compare
Milk Payment
Fat ($/kg) + Protein ($/kg) - Volume (cpl) Equivilent by vol (cpl)
1. 5 7 2 40.4
2. 0 0 0 0.0
3. 0 0 0 0.0
4. 0 0 0 0.0
5. 0 0 0 0.0
6. 0 0 0 0.0
7. 0 0 0 0.0
8. 0 0 0 0.0
9. 0 0 0 0.0
10. 0 0 0 0.0
11. 0 0 0 0.0
12. 0 0 0 0.0
Payment
Components
Volume
Revert Prices
Save Prices

If the payment is entered by volume, the equivalent value expressed as payment for components is shown alongside it, and vica versa.

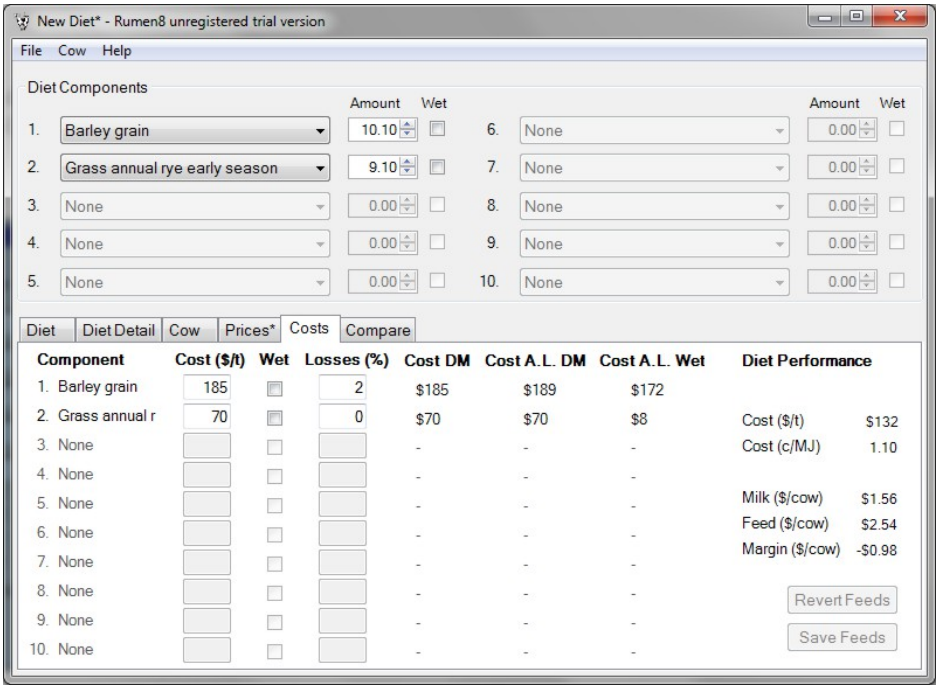
Each of the 12 prices are entered into the entry box/s alongside the numbers 1 to 12. The current price is selected with the radio button to the left of the number.

Clicking the ‘Save Prices’ button saves milk prices. If you have made changes to the current milk prices and they have not been saved an * will appear alongside the ‘Prices’ text in the tab title. This will disappear when the prices are saved. If you have made changes to some of the milk prices and then changed your mind, clicking on the ‘Revert Prices’ button will return to the last saved prices.

Costs

The ‘Costs’ tab allows you to adjust feed prices for those feeds in the current diet without returning to the feed library each time. This is useful for comparing groups of feed sources at different prices without having to create a new feed for each.

Figure 39. The Costs tab.



For each of the current diet feed components you may change the cost on a dry or wet basis and the losses that occur before the cow eats it. The final cost is expressed on a dry matter basis, and then after losses for both dry and wet weights.

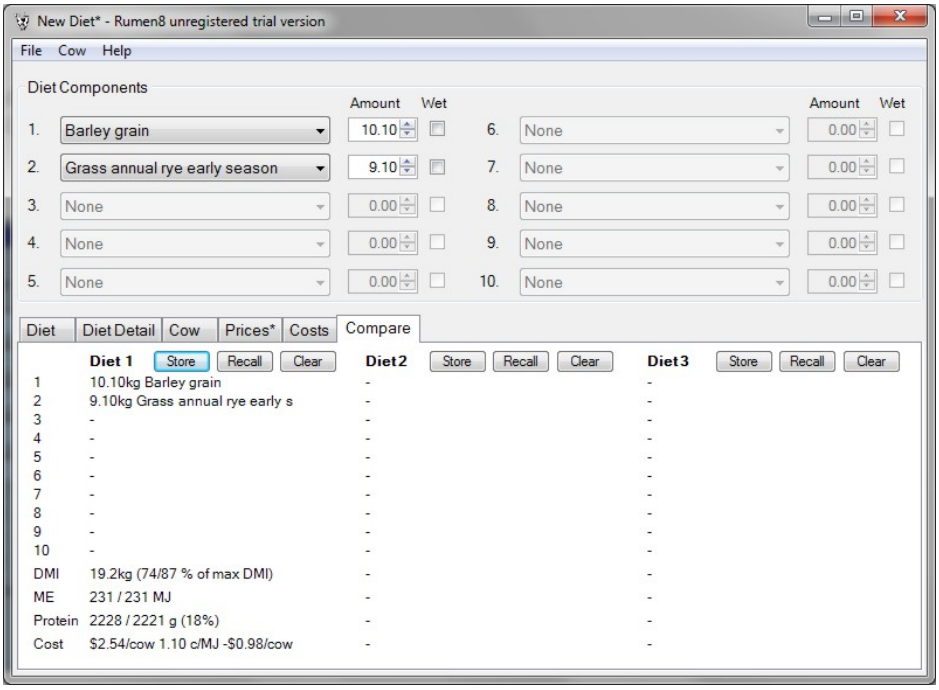
Diet performance is repeated on the right of the tab so for a balanced diet you can see the impact of different feed prices on feed cost and margin.

If you make changes to the feed costs an * will appear alongside the ‘Costs’ title of the tab. This will remain until you save the changes using the ‘Save Feeds’ button at the bottom right of the tab. If you make changes to the feed costs, change your mind and wish to return to the current library values, click the ‘Revert Feeds’ button and the last saved feed prices will be returned.

Compare

The ‘Compare’ tab allows you to build a diet and then save it for comparison with other diets. Think of it as three slots where you can put away a diet while you experiment with other feeds in the main window and then compare between the diets before recalling the best one.

Figure 40. The Compare tab.


New Diet* - Rumen8 unregistered trial version
File Cow Help
Diet Components
Amount Wet
1. Barley grain 10.10
2. Grass annual rye early season 9.10
3. None 0.00
4. None 0.00
5. None 0.00
6. None 0.00
7. None 0.00
8. None 0.00
9. None 0.00
10. None 0.00
Diet Diet Detail Cow Prices* Costs Compare
Diet 1 Store Recall Clear
Diet 2 Store Recall Clear
Diet 3 Store Recall Clear
1 10.10kg Barley grain
2 9.10kg Grass annual rye early s
DMI 19.2kg (74/87 % of max DMI)
ME 231 / 231 MJ
Protein 2228 / 2221 g (18%)
Cost $2.54/cow 1.10 c/MJ -$0.98/cow

The tab has room for three diets numbered 1, 2 and 3 from left to right across the window. To store the diet currently in use, click the ‘Store’ button for one of the diet slots. The 10 components that make up the diet will appear in the slot along with important parameters below. You can store an additional two diets, decide which offers the best solution and then recall this one to the main window by clicking the ‘Recall’ button for that slot. Clicking the ‘Clear’ button will empty a slot.

Optimise (advanced users)

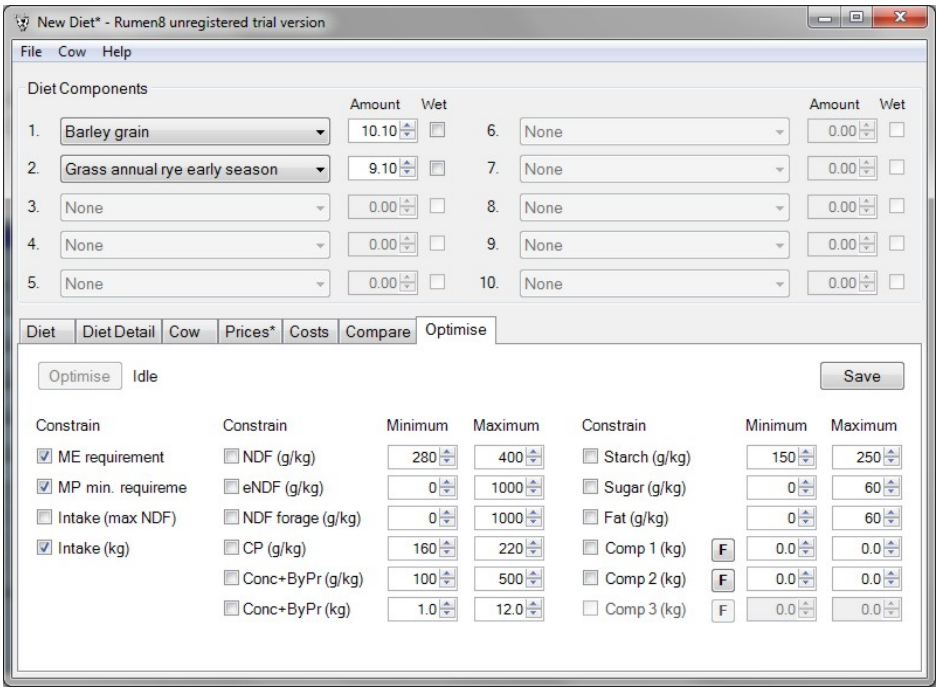
The Optimise function within Rumen8 is not supported, as the setup is difficult unless you have a good knowledge of Microsoft Windows and Excel. In addition, it requires an old version of Excel to be installed (2000, 2002 (XP), 2003 or 2007).

The Optimise tab and button will only be available if it is enabled and then setup in the Rumen8 Preferences. Optimising allows you to fine tune a diet to minimise cost. The optimiser will vary the amount fed of each feed in the diet and attempt to find the cheapest diet that meets the constraints you have chosen. Using the optimiser requires all feeds have up to date costs.

You should first add your feeds to the diet in the approximate quantities required. For the first run of the optimiser enable the ME and MP constraints to ensure it is possible to calculate a diet from the feeds selected that meets the cow's requirements. Once a feasible diet has been found progressively add additional constraints starting with 'Intake (kg)' until you have a diet that meets your needs or the optimiser cannot find a feasible solution. This step-by-step approach is far more likely to result in an optimised diet than simply turning on all the constraints immediately. This is because if a feasible diet cannot be found you know it was the last constraint that is the issue.

Remember, the optimiser simply treats the diet as a mathematical problem to solve and has no nutritional knowledge. Be aware it can find a feasible diet that minimises cost that may harm your cows. Evaluate each feasible diet carefully.

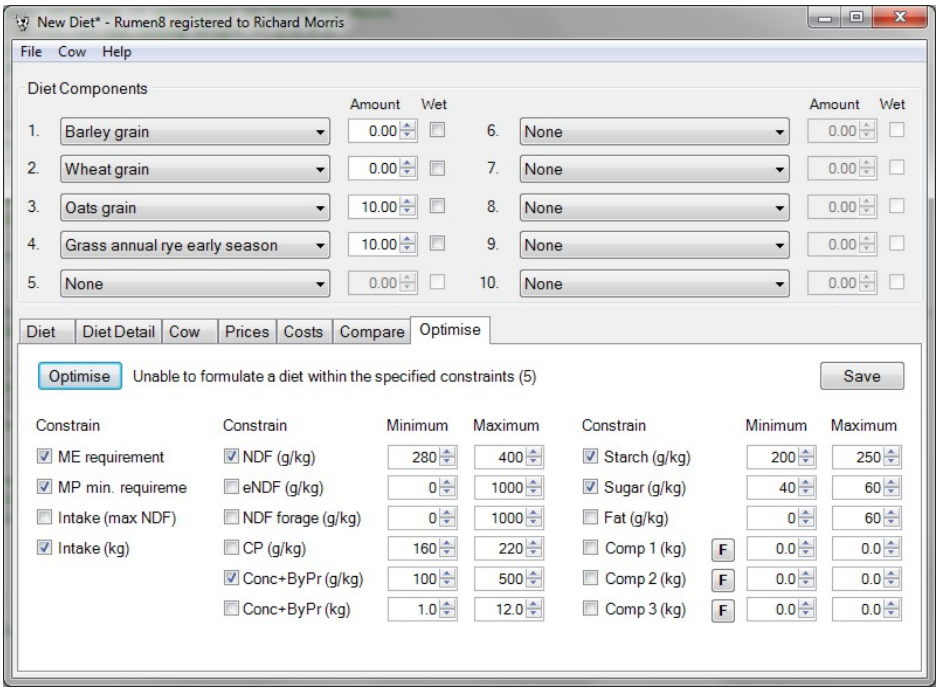
Figure 41.The Optimise tab.


New Diet* - Rumen8 unregistered trial version
File Cow Help
Diet Components
Amount Wet
1. Barley grain 10.10
2. Grass annual rye early season 9.10
3. None 0.00
4. None 0.00
5. None 0.00
6. None 0.00
7. None 0.00
8. None 0.00
9. None 0.00
10. None 0.00
Diet Diet Detail Cow Prices* Costs Compare Optimise
Optimise Idle
Save
Constrain Constrain Minimum Maximum Constrain Minimum Maximum
ME requirement NDF (g/kg) 280 400 Starch (g/kg) 150 250
MP min. requireme eNDF (g/kg) 0 1000 Sugar (g/kg) 0 60
Intake (max NDF) NDF forage (g/kg) 0 1000 Fat (g/kg) 0 60
Intake (kg) CP (g/kg) 160 220 Comp 1 (kg) F 0.0 0.0
Conc+ByPr (g/kg) 100 500 Comp 2 (kg) F 0.0 0.0
Conc+ByPr (kg) 1.0 12.0 Comp 3 (kg) F 0.0 0.0

You can add constraints to control the diet content of NDF, eNDF, NDF supplied by forage, crude protein, concentrate + by-products as g/kg or total kg, starch, sugar and fat. For each of these constraints you must specify the minimum and maximum levels that are acceptable. The narrower the range the less likely a feasible diet can be found. To make the constraint active click the box to the left of the constraint name to put a tick in it.

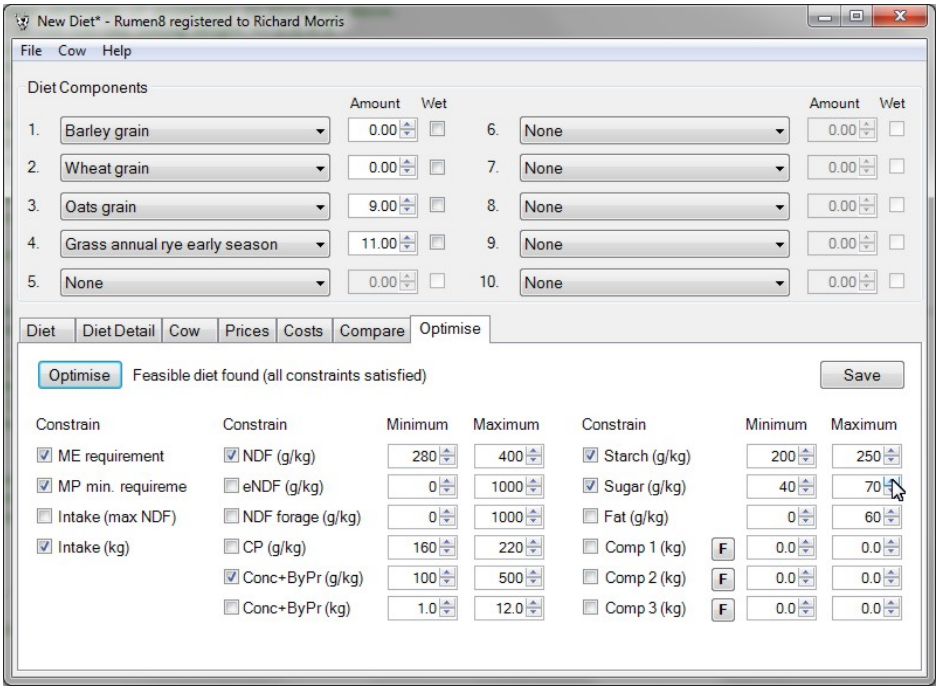
The last three constraints, Comp 1, 2 and 3, refer to diet components 1, 2 and 3. Using these you can specify the amount of three feeds in the diet. The 'F' button enables you to fix a component at the amount currently entered. This is useful when the amount of pasture available has been previously determined and can be fixed with the remainder of the diet components able to be changed to optimise the diet.

Figure 42. The Optimiser has been unable to find a feasible diet.


New Diet* - Rumen8 registered to Richard Morris
File Cow Help
Diet Components
Amount Wet
1. Barley grain 0.00
2. Wheat grain 0.00
3. Oats grain 10.00
4. Grass annual rye early season 10.00
5. None 0.00
6. None 0.00
7. None 0.00
8. None 0.00
9. None 0.00
10. None 0.00
Diet Diet Detail Cow Prices Costs Compare Optimise
Optimise
Unable to formulate a diet within the specified constraints (5)
Save
Constrain Constrain Minimum Maximum Constrain Minimum Maximum
ME requirement NDF (g/kg) 280 400 Starch (g/kg) 200 250
MP min. requireme eNDF (g/kg) 0 1000 Sugar (g/kg) 40 60
Intake (max NDF) NDF forage (g/kg) 0 1000 Fat (g/kg) 0 60
Intake (kg) CP (g/kg) 160 220 Comp 1 (kg) F 0.0 0.0
Conc+ByPr (g/kg) 100 500 Comp 2 (kg) F 0.0 0.0
Conc+ByPr (kg) 1.0 12.0 Comp 3 (kg) F 0.0 0.0

When a feasible diet cannot be found check the 'Diet detail' tab to see how close the optimiser was to succeeding. This may give you a hint as to which constraint is preventing optimisation. You can then either add additional feeds or relax a constraint until a feasible diet is found.

Figure 43. Successful optimisation after relaxing the sugar constraint.


New Diet* - Rumen8 registered to Richard Morris
File Cow Help
Diet Components
Amount Wet
1. Barley grain 0.00
2. Wheat grain 0.00
3. Oats grain 9.00
4. Grass annual rye early season 11.00
5. None 0.00
6. None 0.00
7. None 0.00
8. None 0.00
9. None 0.00
10. None 0.00
Diet Diet Detail Cow Prices Costs Compare Optimise
Optimise
Feasible diet found (all constraints satisfied)
Save
Constrain Constrain Minimum Maximum Constrain Minimum Maximum
ME requirement NDF (g/kg) 280 400 Starch (g/kg) 200 250
MP min. requireme eNDF (g/kg) 0 1000 Sugar (g/kg) 40 70
Intake (max NDF) NDF forage (g/kg) 0 1000 Fat (g/kg) 0 60
Intake (kg) CP (g/kg) 160 220 Comp 1 (kg) F 0.0 0.0
Conc+ByPr (g/kg) 100 500 Comp 2 (kg) F 0.0 0.0
Conc+ByPr (kg) 1.0 12.0 Comp 3 (kg) F 0.0 0.0

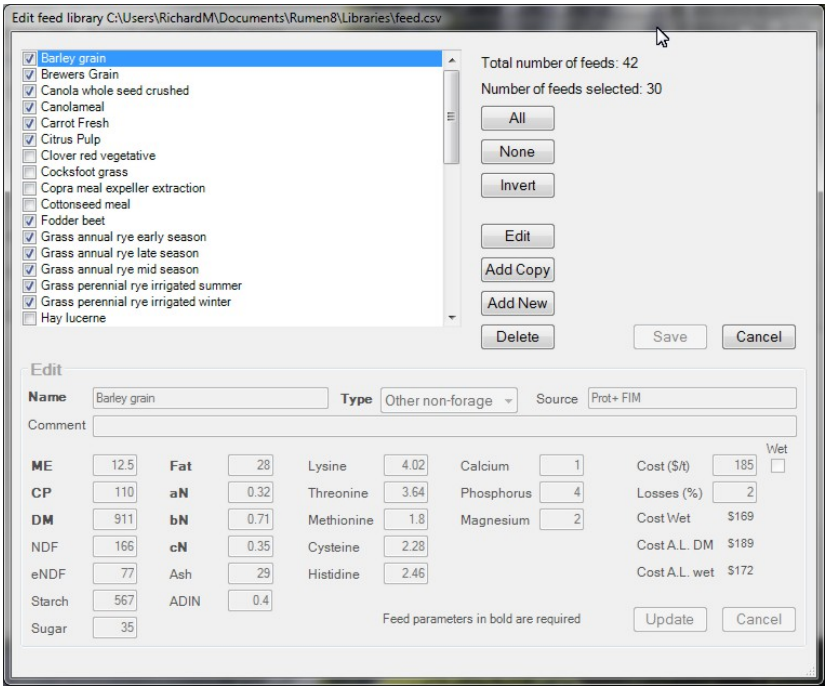
The Feed Library Editor

The feed library is accessible from the File menu of the main Rumen8 window. It allows you to edit all the parameters for each feed in the library. The feed library window is divided into two sections, the top selection section showing all the feeds available in the library and the bottom the individual parameters for the currently selected feed.

The title bar of the windows shows the path to the current feed library, which is useful if you are changing between the default feed library and local feed libraries. The total number of feeds and the number currently visible in the diet component drop down lists are also displayed.

The feed library is stored in a plain text file called feed.csv located in the Rumen8 Libraries folder. It can be edited with another application such as Excel if you wish. However, always keep a backup of the feed.csv file because if you change the format of the file accidently Rumen8 will be unable to load it.

Figure 44. The Feed Selection window.



Feed selection

The list of feeds in the top left of the feed library window shows all the feeds available in the current library. Feeds with a tick in the box to the left of their name will be visible in the diet component drop down lists of the main Rumen8 window. This allows you to have a large feed library but only make a subset of feeds applicable to the current situation visible when designing diets.

The currently highlighted feed has its parameters displayed in the bottom edit section of the window.

The 9 buttons do the following:

All Make all feeds in the library visible in the main Rumen8 window.

None Make none of the feeds visible.

Invert	Invert the current feed selection so ticked feeds are unselected and un-ticked feeds are selected.
Edit	Edit the parameters of the currently selected feed in the lower part of the window.
Add Copy	Add a new feed to the library that is a copy of the currently selected feed.
Add New	Add a new blank feed to the library.
Delete	Remove the currently selected feed from the library.
Save	Save the changes to the feed library and exit to the main Rumen8 window.
Cancel	Exit to the main Rumen8 windows losing all the changes made to the feed library.

Feed parameters

To edit an individual feed highlight it in the feed list and click the 'Edit' button. The entry boxes in the Edit section of the window will become active and allow you to change any of the feed parameters.

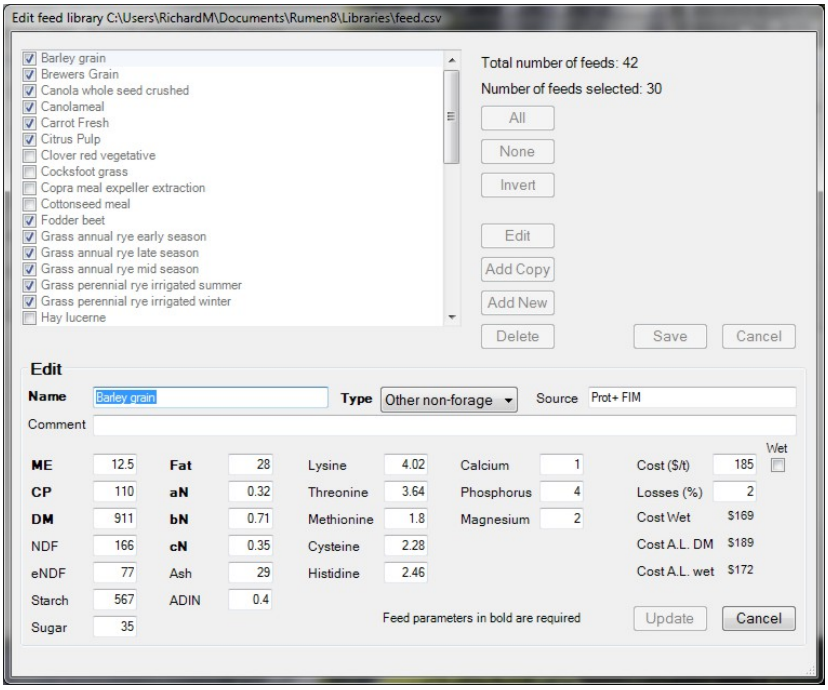
As a minimum, nine parameters are required for a feed to be accepted as valid. These are a unique name, feed type, ME, CP, DM, Fat, aN, bN and cN. Until valid values for these parameters are entered you will be unable to save the feed.

If you unsure what the parameters are or the units, hover your mouse over the name and a tooltip will appear with the full name and measurement units. Abbreviations are also listed at the end of this document.

If you enter an invalid value into the entry box for any of the parameters, the parameter name will turn red. You can hover the mouse over the parameter name and a tooltip will appear telling you the acceptable range.

Once you have entered all the feed parameters you have, or have edited an existing feed, click on the 'Update' button to save your changes and return to feed selection at the top of the window. If you wish to abandon any changes you have made click the 'Cancel' button. At this stage the changes have not been saved to disk. This will happen when the 'Save' button is clicked.

Figure 45. Entering parameters for an individual feed.



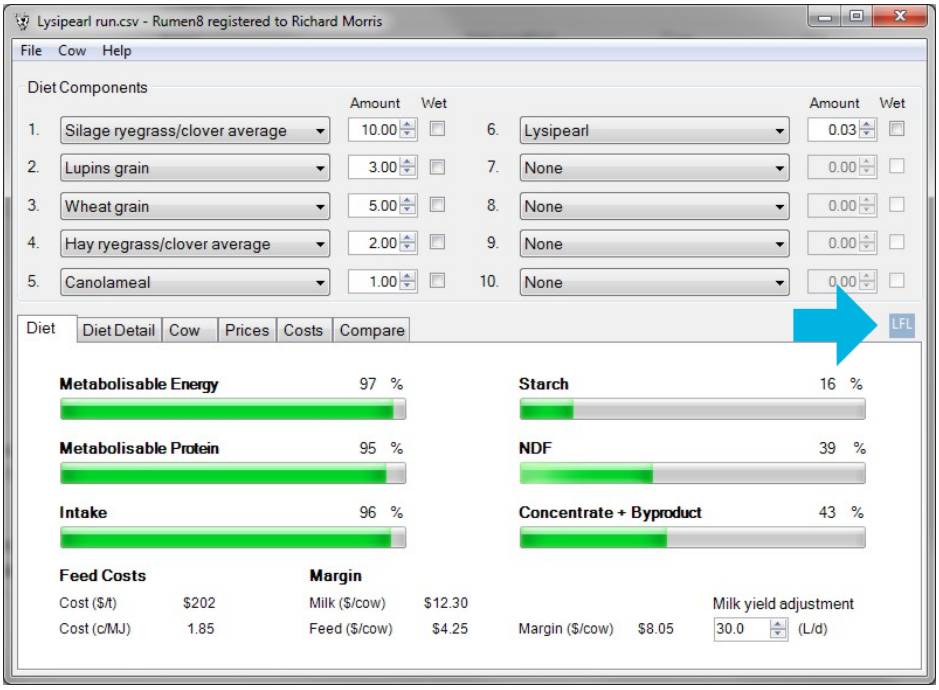
Local feed libraries (advanced users)

Rumen8 allows you to place local feed libraries in the folder with previously saved diets. This means a small group of feeds specific to a particular property or scenario can be saved alongside the related diet files.

Currently Rumen8 does not allow you to save the default feed library as a local feed library. You must manually copy a feed library into the folder with a diet file using the Windows Explorer. If there is enough demand for this feature it will be added in a later version.

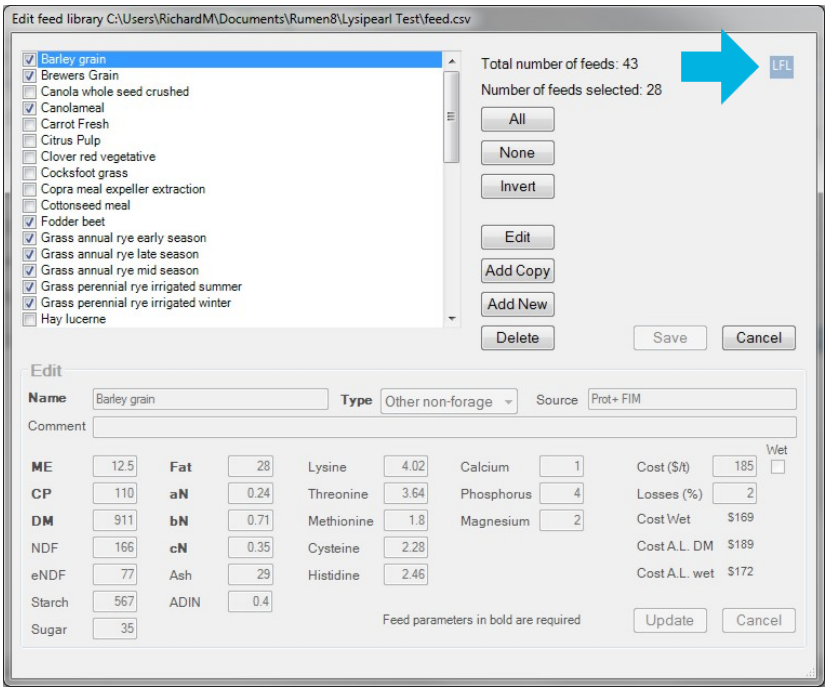
If local feed libraries are turned on in the preferences and a feed.csv file is present in the folder when you open a diet file Rumen8 will automatically load the local feed library. A blue rectangle with LFL inside it will appear at the top right of the tabs in the main window to remind you a local feed library is being used.

Figure 46. The local feed library flag in the main window.



If you have a local feed library loaded the LFL flag will also appear in the feed editor window and the path to the feed library will be shown in the title bar of the window.

Figure 47. The local feed library flag in the feed editor window.

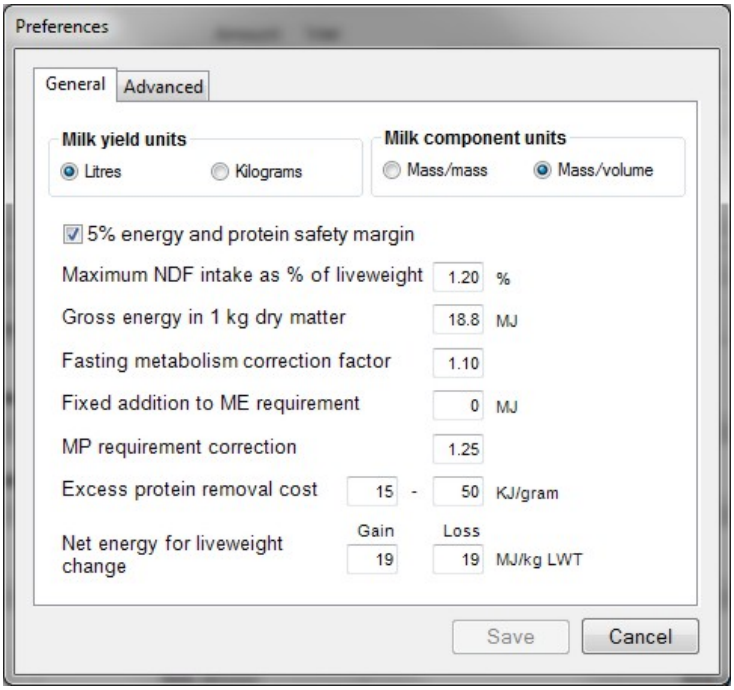


Preferences

Access to the preferences window is via the Preferences option in the File menu of the main Rumen8 window. The settings you can adjust in Rumen8 are divided into General and Advanced tabs.

General preferences

Figure 48. The General preferences tab.



Milk yield units

Milk yield can be entered and reported in litres or kilograms.

Milk component units

The fat, protein and lactose percentage of milk can be entered and reported in mass/volume (kg/litre) or mass/mass (kg/kg) units.

5% energy and protein safety margin

Turn this on to add a 5% safety margin to the cows energy and protein requirement. Turning this on is recommended by the feeding standard.

Maximum NDF intake as a % of liveweight

Enter the % of liveweight used for calculation of potential intake. This method is not recommended for dairy cows and is only included for comparative purposes.

Gross energy in 1 kg of dry matter

Enter the gross energy contained in 1 kilogram of dry matter in mega joules. Used as part of the cow energy requirement calculation.

Fasting metabolism correction factor — Rumen8 will increase the fasting metabolism energy requirement by multiplying it by this value.

Fixed addition to ME requirement — Rumen8 will add this value to the cows energy requirement.

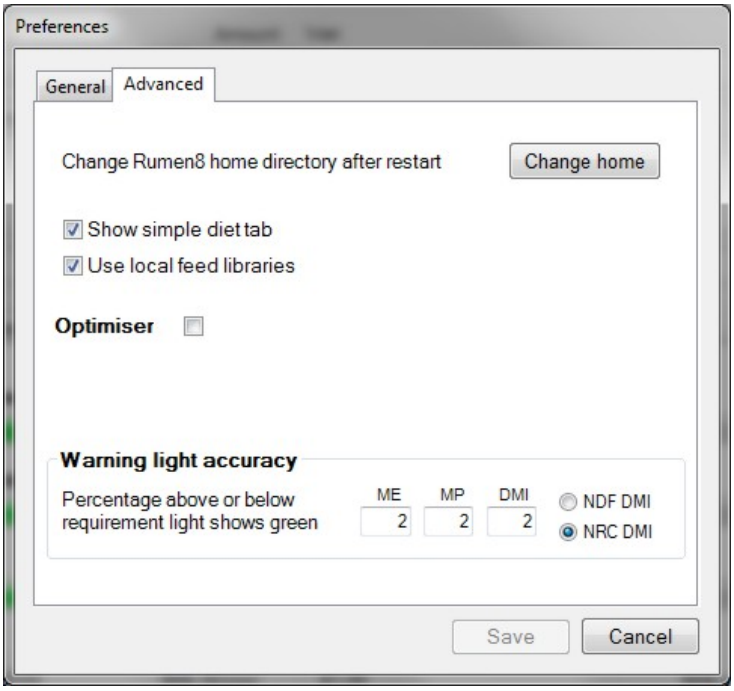
MP requirement correction — The cows total protein requirement will be multiplied by this value.

Excess protein removal cost — The range of values for the cost of removing excess protein by the cow. A range is provided as there are many values quoted in the literature.

Net energy for liveweight change — The net energy liberated by liveweight loss or required for liveweight gain.

Advanced preferences

Figure 49. The Advanced preferences tab.



Change the Rumen8 home directory after restart.

If you want to change where Rumen8 stores its files (usually Documents\Rumen8) then clicking the 'Change home' button will cause Rumen8 to ask you where to place the Rumen8 directory again next time it is started. If this is a new directory the default feed library and preferences files will be copied across. If you wish to retain your existing library files you will have to copy them into the new location using Windows Explorer.

Show simple diet tab — The 'Diet' tab can be turned off by un-ticking this box. Useful if you only use the 'Diet Detail' tab.

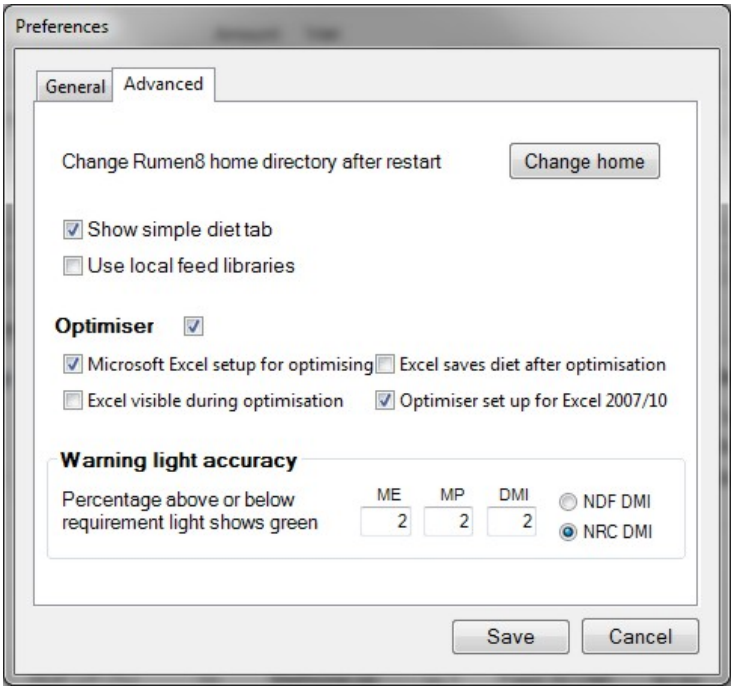
Use local feed libraries — Tick this box if you would like Rumen8 to use local feed libraries if they are present when you load a previously saved diet.

Optimiser	The 'Optimiser' tab will be available in the main window if this box is ticked. This also makes available the optimiser preferences below it. See Optimiser section of this document for more information on using the optimiser.

The Optimiser parameters

Microsoft Excel setup for optimising	Tick this box if you have correctly set up the optimiser in Excel.
Excel visible during optimization	Tick this to see Excel load and optimise the diet. Usually left un-ticked.
Excel saves diet after optimization	Tick this to make Excel save the optimiser spreadsheet after optimizing the diet. Usually left un-ticked.
Optimiser set up for Excel 2007	Tick this if you have Excel 2007 available for Rumen8 to use. If this is not ticked Rumen8 assumes you have Excel 1997, 2000, 2002 (XP) or 2003 installed.

Figure 50. The Optimiser parameters in Preferences.



The Optimiser has not been tested but may work with Microsoft Excel version 2010 or 2013. Compatibility with these versions may be added in a later upgrade to Rumen8. Multiple versions of Excel can be installed so if you are currently using Excel 2013 you could install Excel 2007 to make use of the Rumen8 optimiser. Installation instructions are given later in this document.

Note: The Rumen8 optimiser is unsupported and is recommended only for users with a good knowledge of Microsoft Windows and Excel.

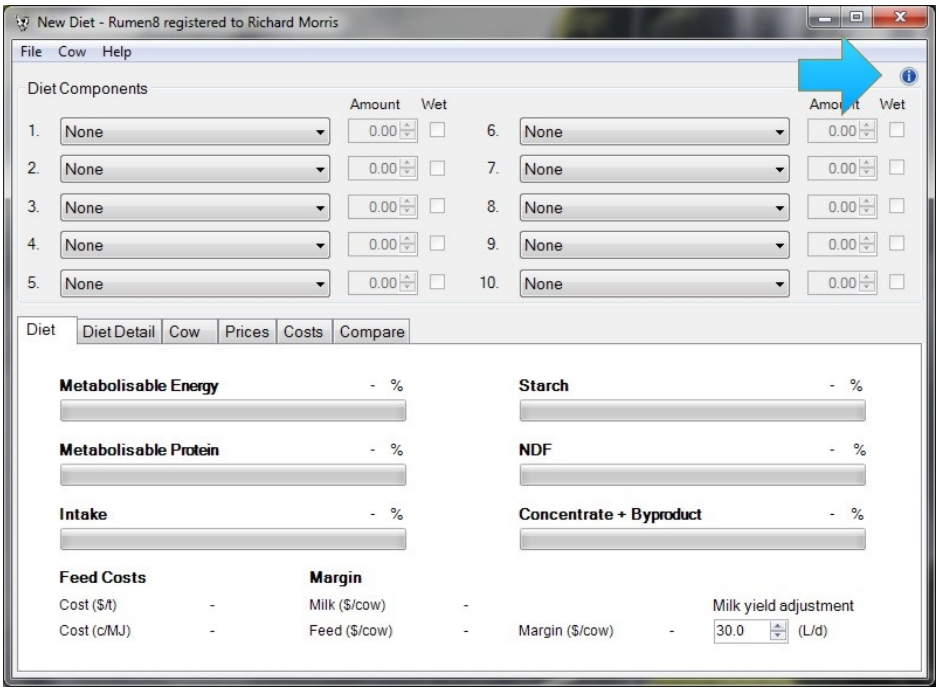
Warning light accuracy These parameters set the sensitivity of the 'traffic lights' for the cows energy, protein and intake on the main window and the green bars in the 'Diet' tab. The lights will show green if the diet provides an amount of energy, protein or dry matter intake that is within this percentage of the cow's requirement.

The NDF and NRC DMI radio buttons determine which intake calculation method is used. It is either based on maximum NDF intake as a percentage of liveweight (set in the general preferences) or by the methodology specified by NRC (2001). The NRC (2001) method is recommended for dairy cows.

Keeping Rumen8 Updated

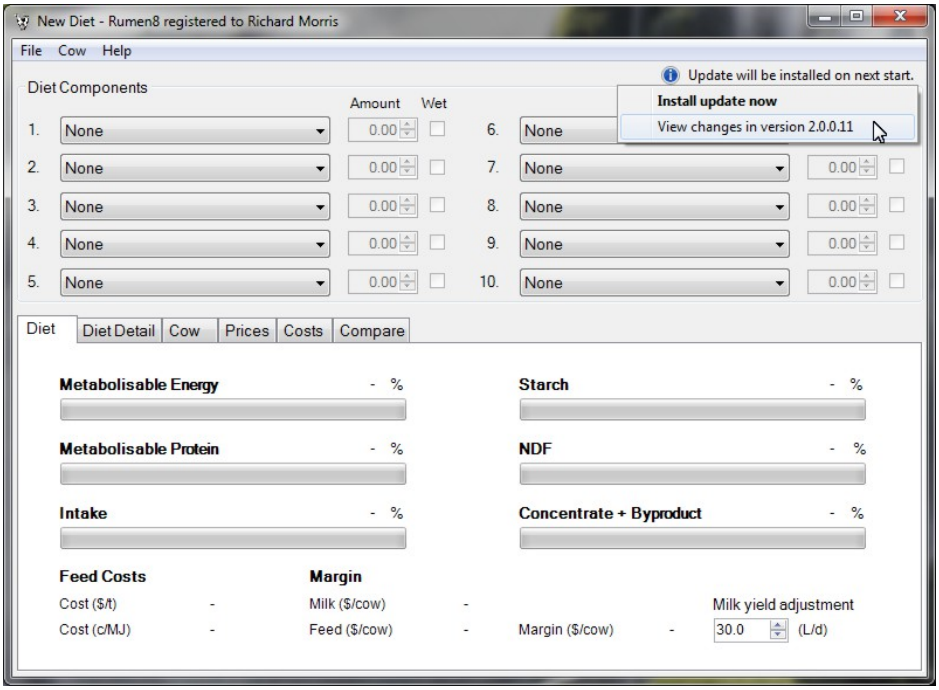
Rumen8 can check for updates if your computer is connected to the Internet. Select 'Check for updates' under the Help menu and if an update is available a small blue information icon will appear at the top right of the main window.

Figure 51. Blue arrow pointing to the information icon that means an update is available.



Clicking on the blue information icon will roll out a menu telling you the update will be installed the next time Rumen8 starts. If you click on this text a drop down menu gives you the choice to install the update now or view the changes in the new version.

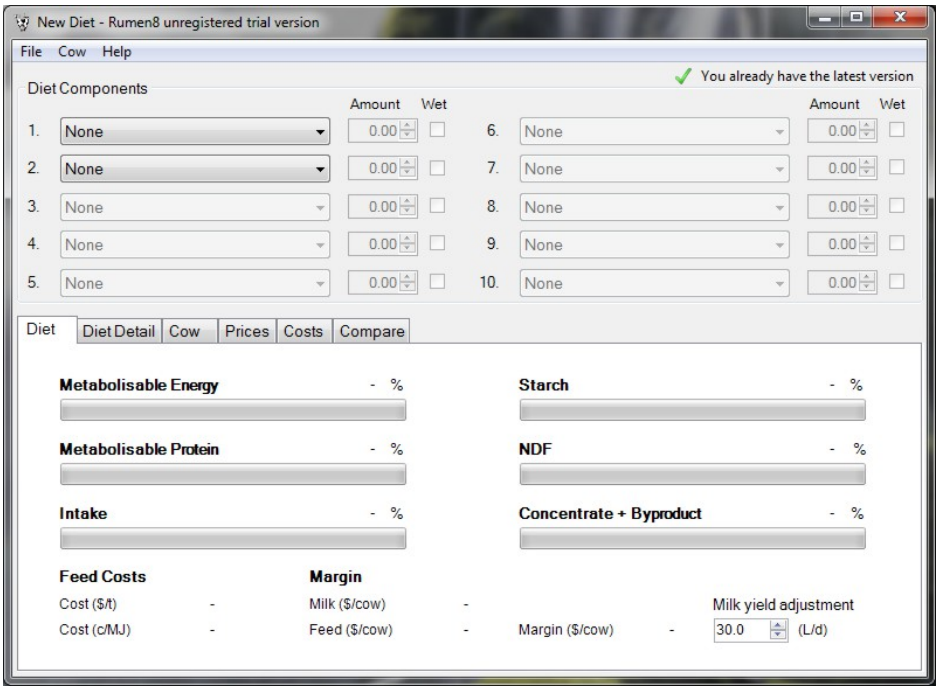
Figure 52. Installing an update or viewing changes.



When Rumen8 is restarted it will download the files required, update your installation of Rumen8 and then start the new version. The blue information icon will be replaced by a green tick which when clicked will confirm you have updated to the new version.

If you check for updates and there is not one available a green tick will appear at the top of the main window and if you click on it, it will confirm you already have the latest version of Rumen8.

Figure 53. You have the latest version of Rumen8.



Rumen8 will check for updates everyday automatically if your computer has a connection to the Internet.

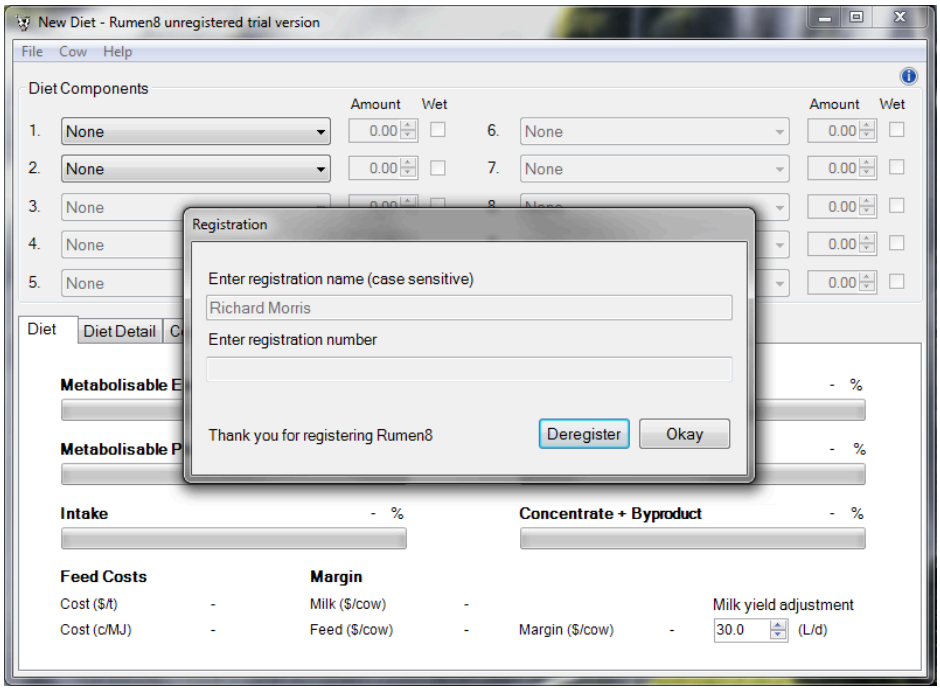
If your computer is offline, you can manually download the latest version of Rumen8 from the website, uninstall the current version in the Control Panel and then re-install the new version. Your library and diet files will not be changed when you do this.

Uninstalling Rumen8

Completely removing Rumen8 from your computer will take three steps.

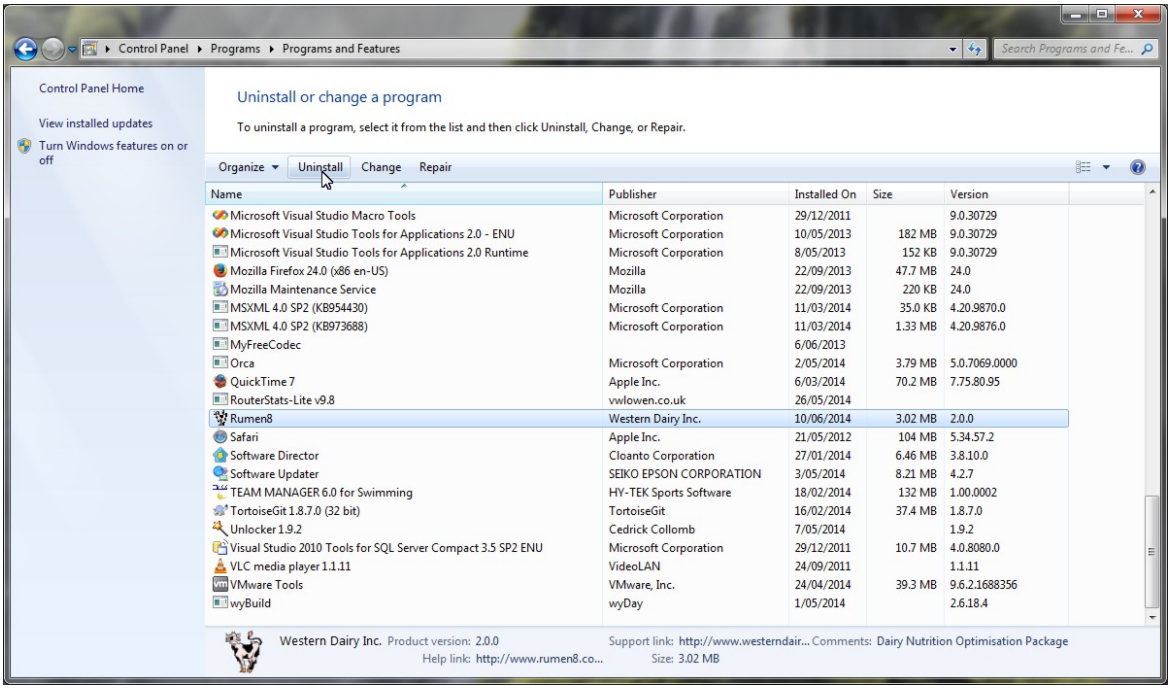
1. Remove your registration information from the computer.
   Go to the Registration option under the Help menu and click the 'Deregister' button. Your details will be removed from the computer and Rumen8 will revert to trial mode.

Figure 54. Removing the registration information from Rumen8.



2. Uninstall the Rumen8 software.
   Go to the Windows Control Panel and in the 'Programs' section click on 'Uninstall a program'. Select Rumen8 from the list and click the 'Uninstall' button at the top of the list. Follow the prompts and Rumen8 will be removed from your computer.

Figure 55. Uninstalling Rumen8



3. Delete the Rumen8 folder from your Documents folder.
   Doing this will mean you will lose your feed library, preferences and any saved diet files.

4. (Optional) Delete the 'Western Dairy Inc.' folder containing the settings files from the AppData\Local folder from within your user folder. This folder is normally hidden so this step is for advanced users only.

Optimiser Installation (advanced users)

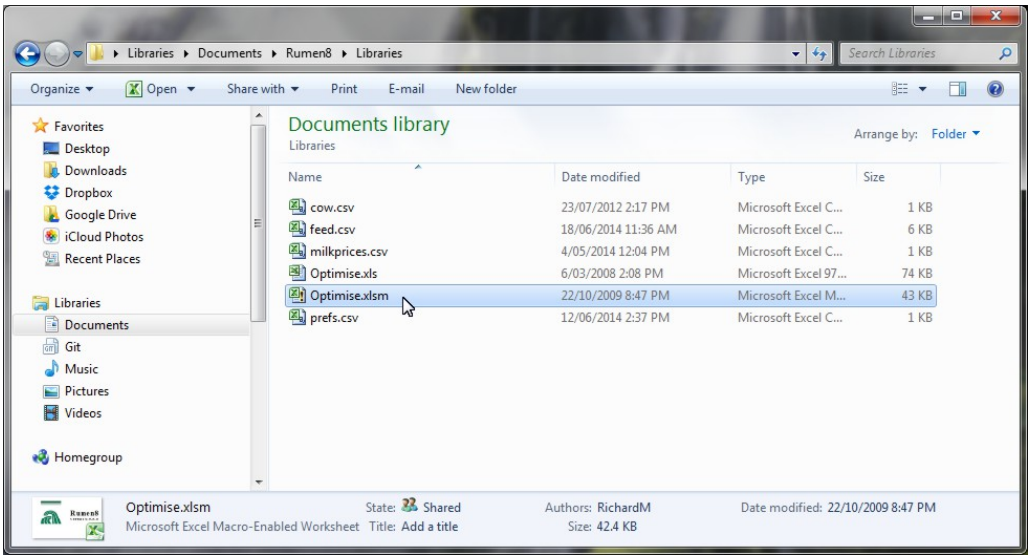
The optimise function in Rumen8 is unsupported. This is because it requires communication with an older version of Microsoft Excel (it uses the Solver add-on) and setup is difficult. However, if you have a good knowledge of Microsoft Excel and Windows and would like to try setting it up the steps for Excel 2007 are listed below. Even if you are using a later version of Excel, it is possible to also install an older version to be used by the Rumen8 alongside your current version.

The Optimiser in Rumen8 requires Microsoft Excel to be installed. It has been tested with Excel version 8, 9, 10, 11 and 12 (included in Office 97, 2000, 2002 (XP), 2003 and 2007 respectively).

Installation instructions for Excel 2007

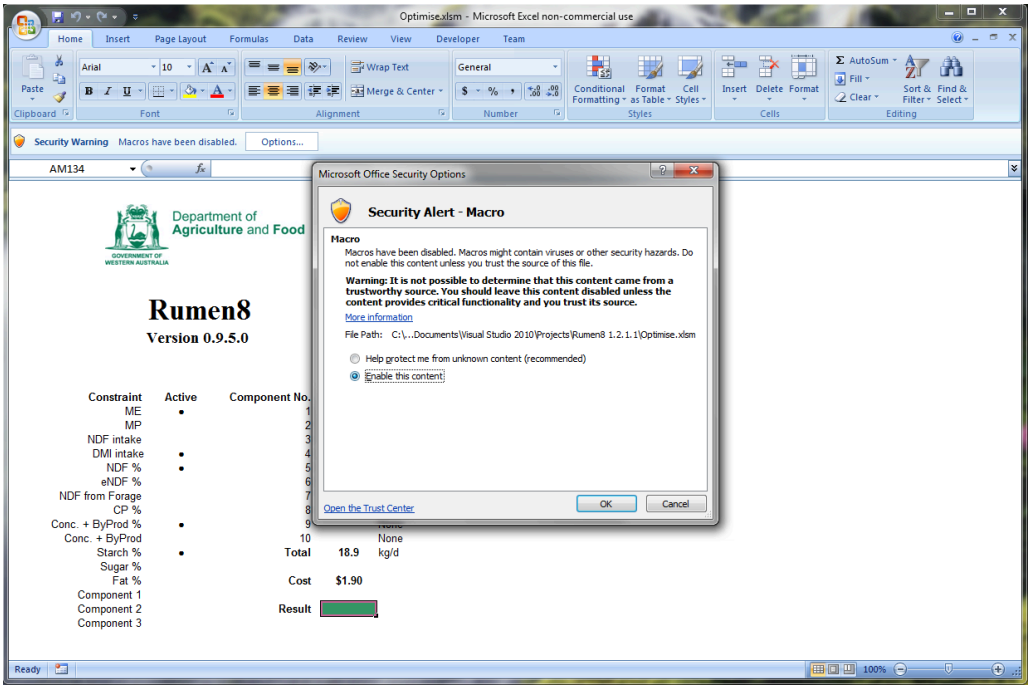
1. Open the Optimise.xlsm spreadsheet in the Rumen8\libraries folder in Excel 2007.

Figure 56. Open the Optimise.xlsm spread sheet.



2. If Excel's security level is to the default level you will be prompted with a Security warning that macros have been disabled under the ribbon menu. Click on 'Options' button and 'Enable this content' in the window that appears. If Excel's security level is set too high it will automatically disable macros which will prevent Rumen8 from optimising diets.

Figure 57. Enable macros in the optimiser spread sheet.



3. From the Excel button click on the 'Excel Options' button at the bottom of the menu. On the left side of the window click on the 'Trust Centre' and then the 'Trust Center Settings' button to enter the Trust center. Set Macro settings to 'Disable all macros with notification' and turn on "Trust access to the VBA project object model'. Click 'Okay' to get back to Excel Options.

Figure 58. Accessing Excel Options from the Excel menu.

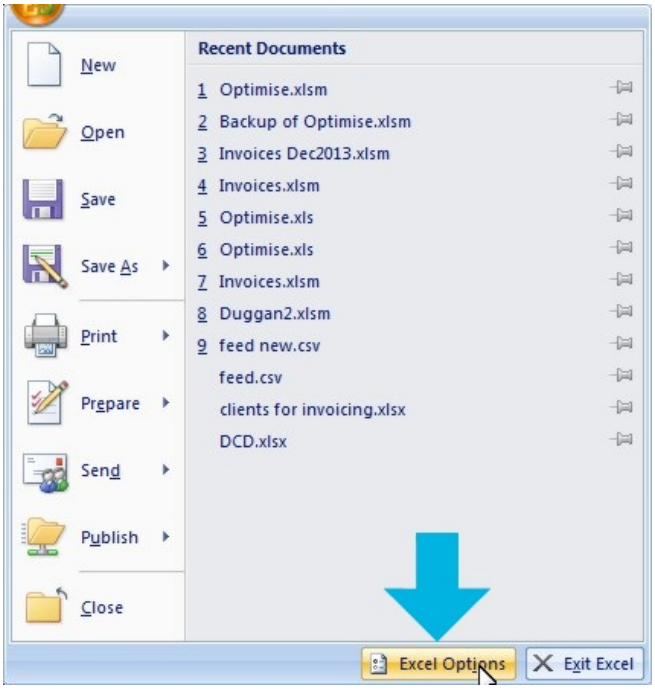
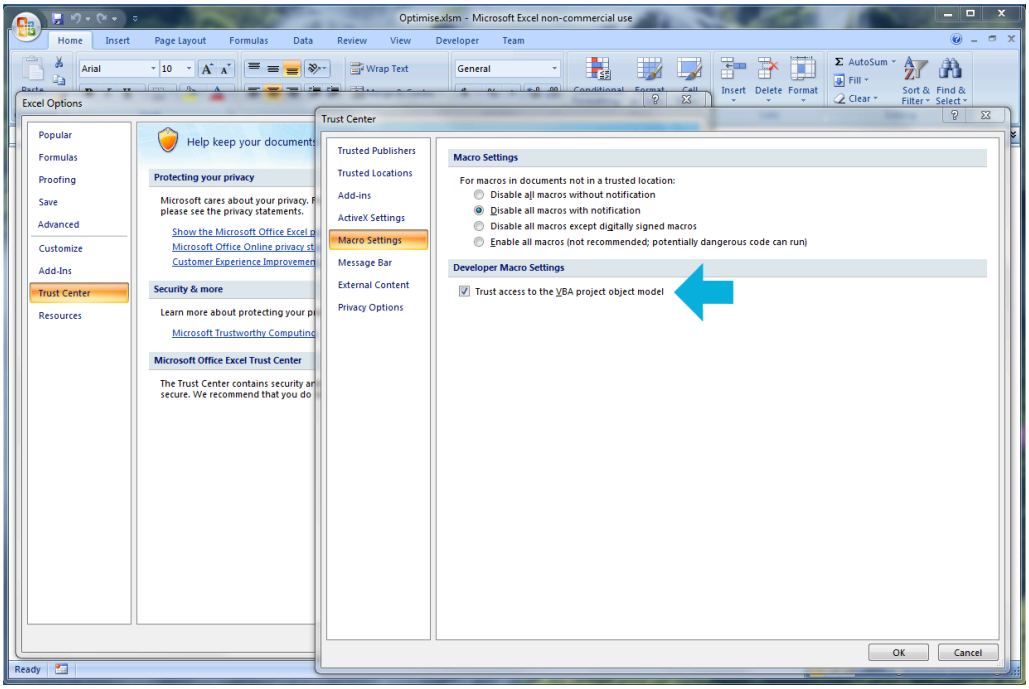


Figure 59. Allow access to Solver from Rumen8.



4. Click on the 'Add-Ins' section on the left of the windows and then set the Manage drop down list at the bottom of the window to 'Excel Add-Ins' and click the 'Go' button. A list of possible Add-Ins appears in the new window so click on the checkbox alongside 'Solver Add-In' to install it. Click 'Okay' to install Solver and get back out to the spreadsheet.

Figure 60. Install the Solver Add-In.

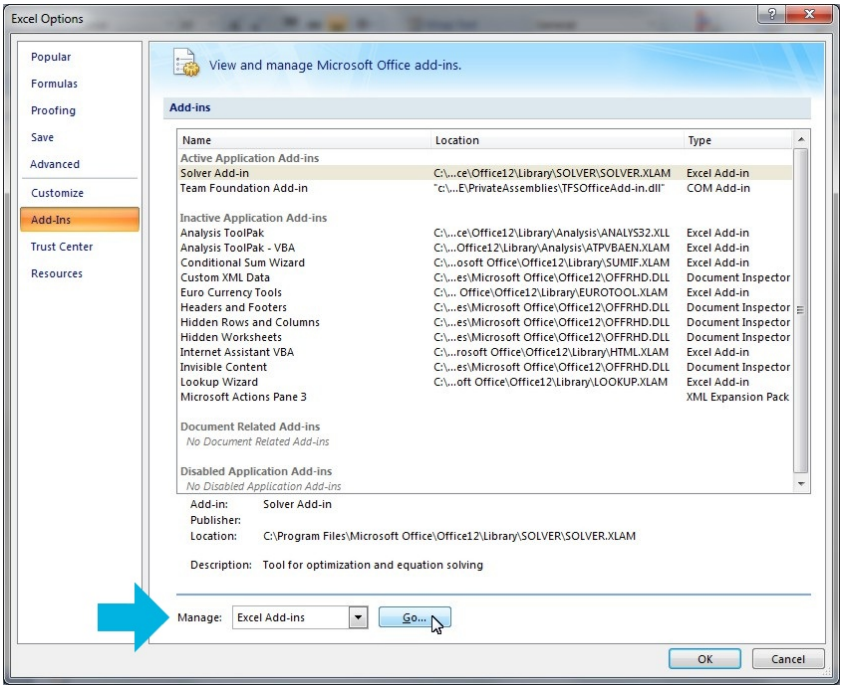
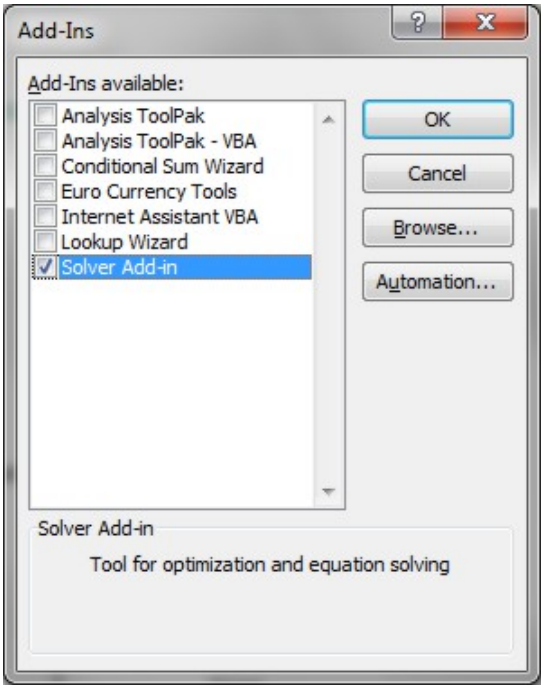
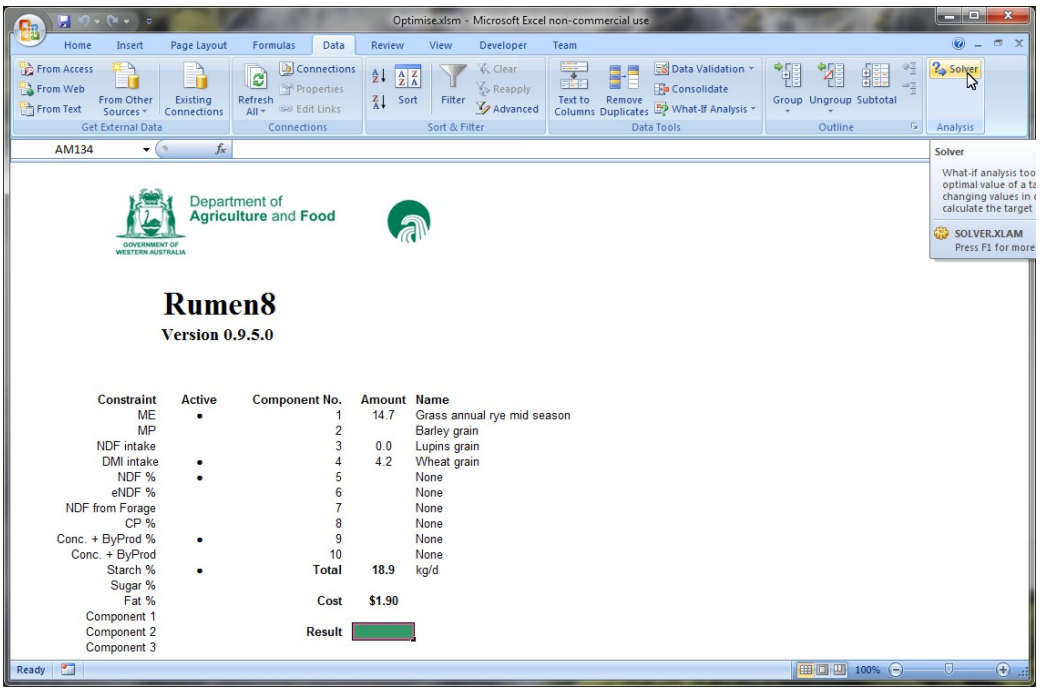


Figure 61. Install the Solver Add-In.



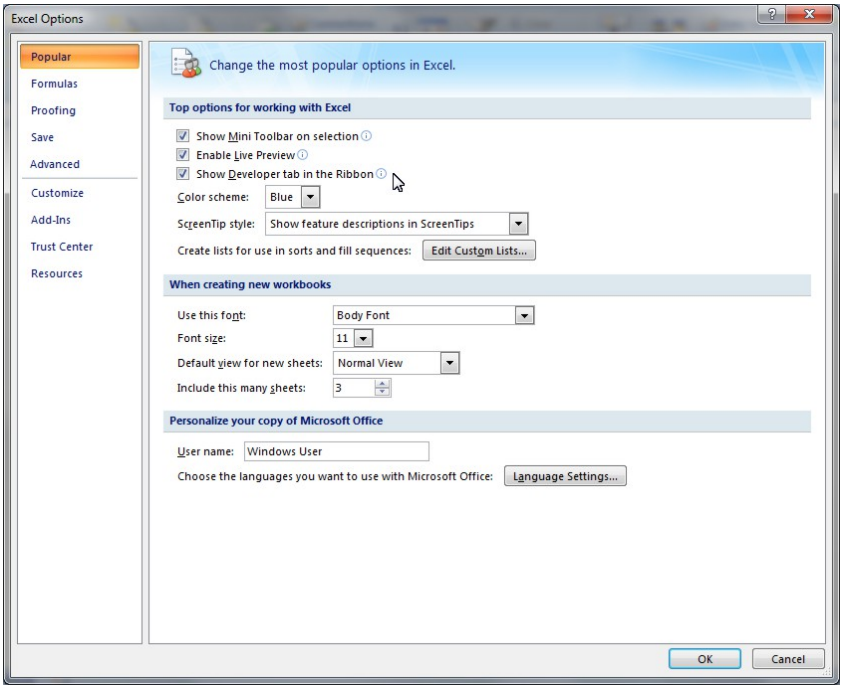
5. Confirm Solver is correctly installed by selecting 'Solver' from the 'Data' ribbon. Exit from Solver by clicking on the 'Close' button.

Figure 62. Check Solver is install and working correctly.



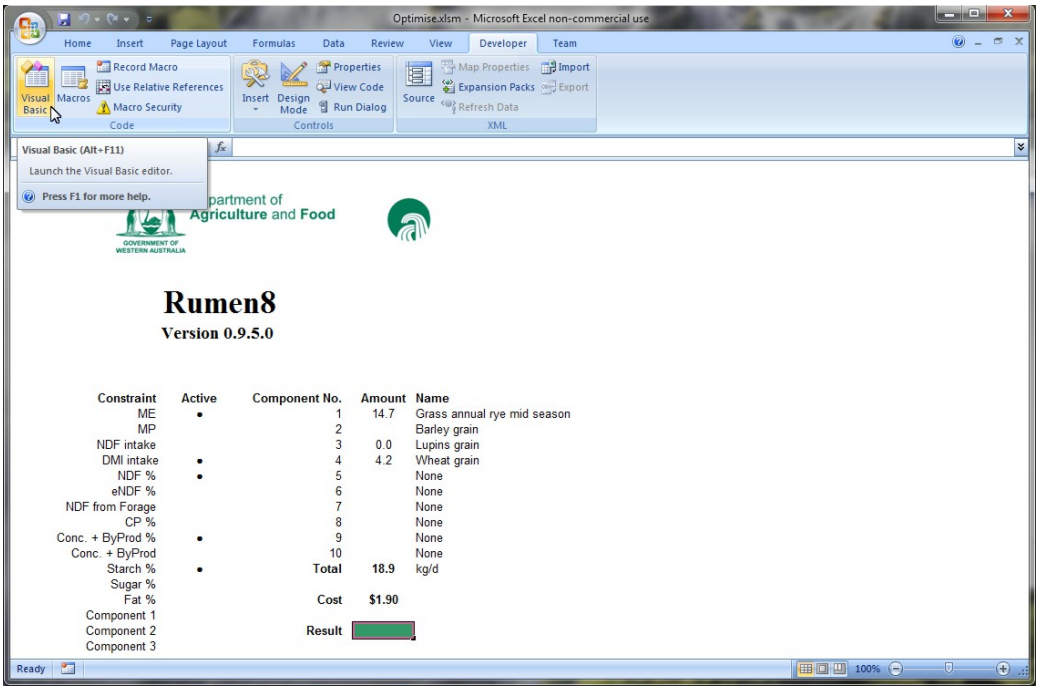
6. If the 'Developer' ribbon menu is not present go back into 'Excel Options' and the 'Popular' group of options and turn on 'Show Developer tab in the Ribbon'.

Figure 63. Turn on the Developer menu in the Ribbon.



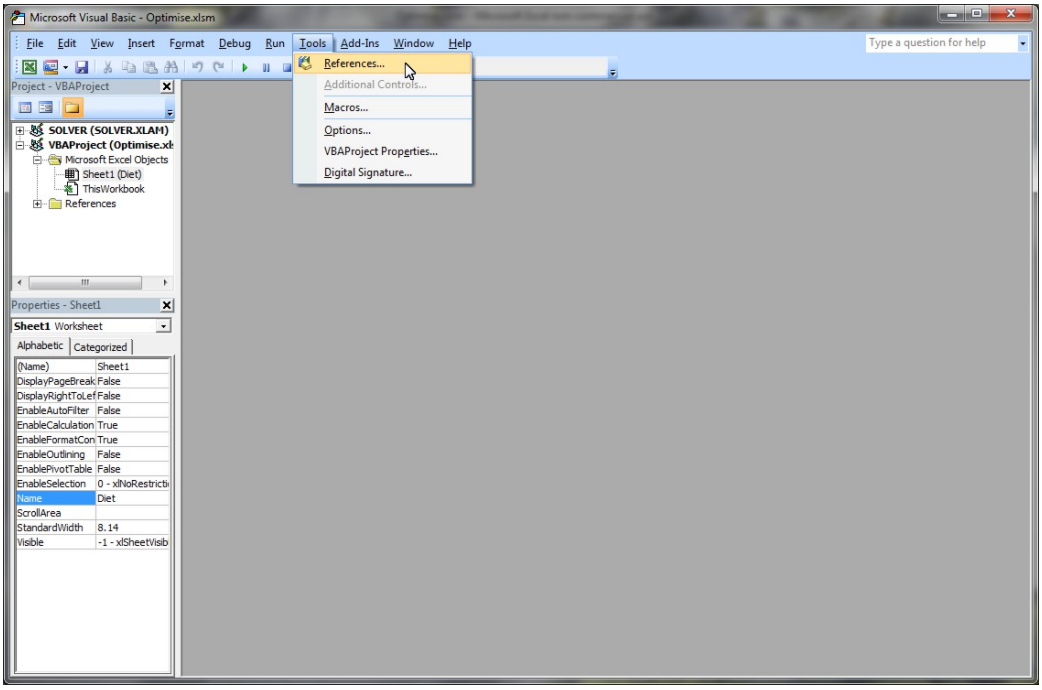
7. Start the Visual Basic Editor by selecting 'Visual Basic' from the 'Developer' ribbon.

Figure 64. Start the Visual Basic editor.



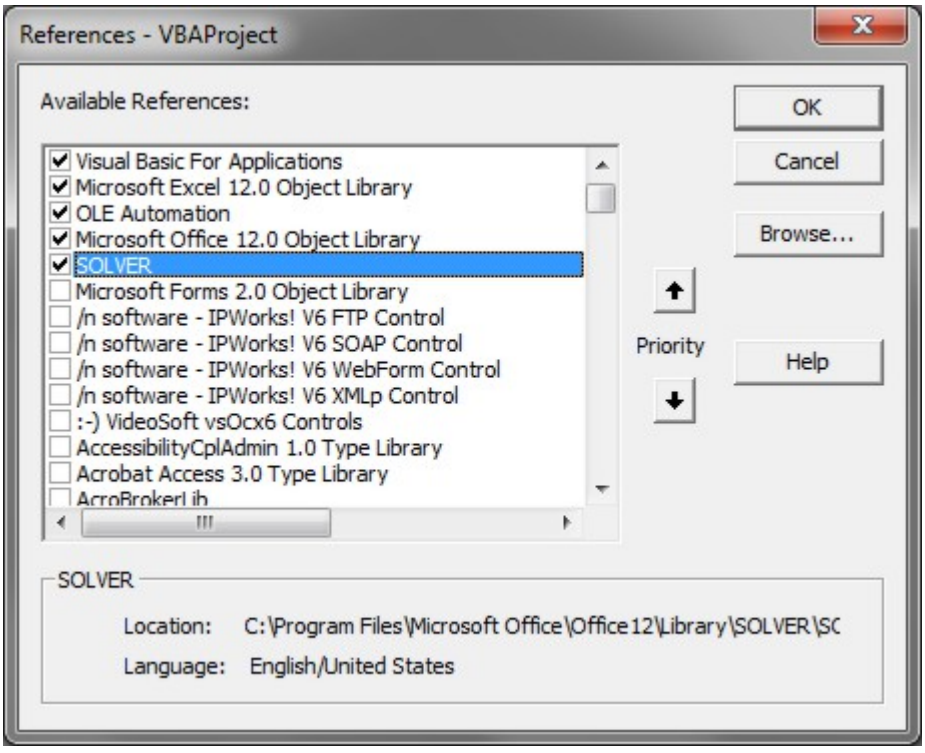
8. In the Visual Basic Editor select 'References' from the 'Tools' menu. This will bring up the References dialog box with an entry for Solver, usually with 'Missing' alongside it. You may need to search down the list to find it.

Figure 65. Add access to the Solver from Visual Basic.



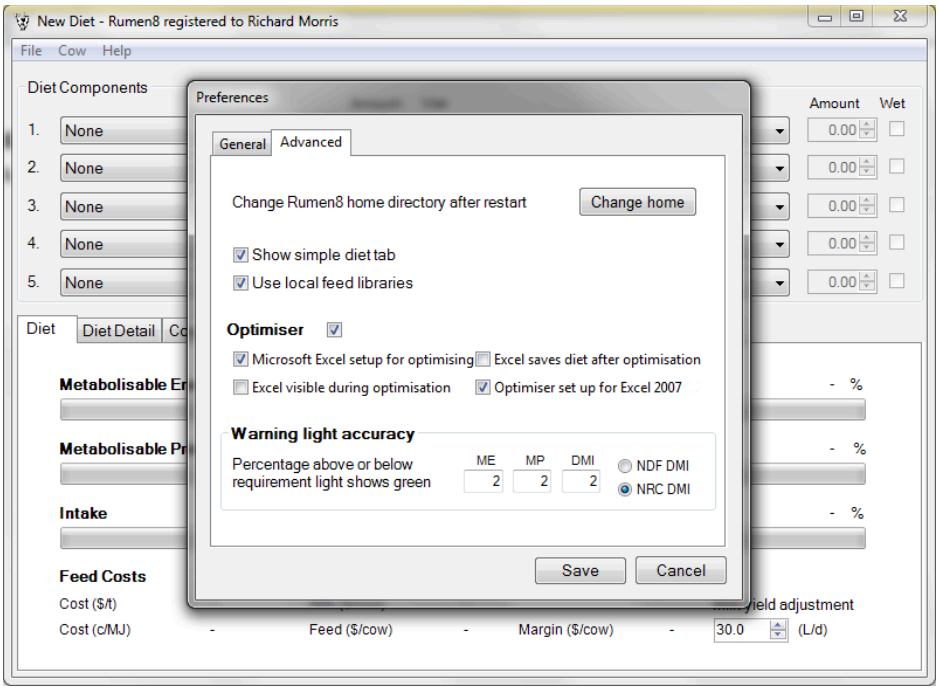
9. Visual Basic needs to know where to find the Solver add-in. Click the Browse button and navigate to the directory in which Microsoft Office has installed the solver files. This is usually "C:\Program Files\Microsoft Office\Office 12\Library\Solver". At the bottom of the dialog box change the "Files of type" drop down to show all files. Solver.XLAM should now become visible. Select it and press "Open".
10. The Solver reference should no longer be listed as missing. Ensure it has a tick against it and click the 'Okay' button to exit the window.

Figure 66. Solver is installed correctly for Visual Basic.



11. Exit back to the spreadsheet using the 'File' menu and the 'Close and Return to Microsoft Excel' option.
12. Excel setup for use with Rumen8 optimisation is now complete so exit from Excel saving the changes.
13. Rumen8 defaults to not allow access to the optimiser so the final step is to tell it you have configured Excel correctly. In the Rumen8 Preferences first enable the Optimiser tab by ticking the option and then the "Excel/Solver installed" option should be also ticked. Also tick the last Optimiser preference to tell Rumen8 you are using Excel 2007, not 2003 or earlier.

Figure 67. Setup the Rumen8 preferences to use the optimiser.



Now when you return to the main Rumen8 window a new tab called 'Optimiser' will be available.

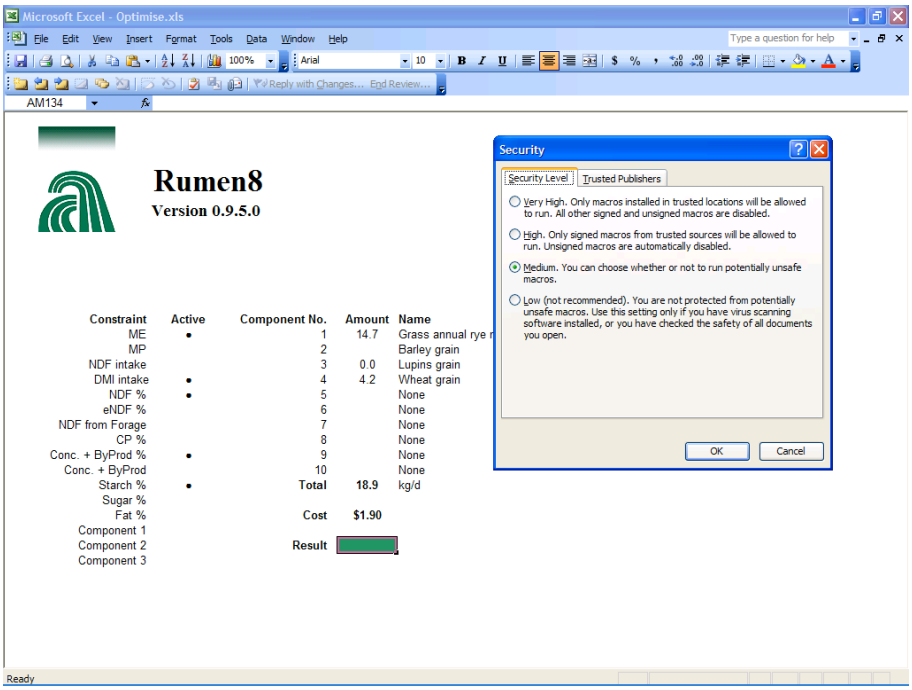
The Optimiser has been successfully used with Excel 2010 but it has proven unreliable on some computers. The setup is very similar to Excel 2007 and may work for you. It hasn't been tested with Excel 2013.

Installation instructions for Excel 2003

1. Open the Optimise.xls spreadsheet in the Rumen8\libraries folder in Excel 2003.
2. If Excel's security level is set to medium you will be prompted that Optimiser contains macros. Click on "Enable Macros" to continue to the spread sheet display.

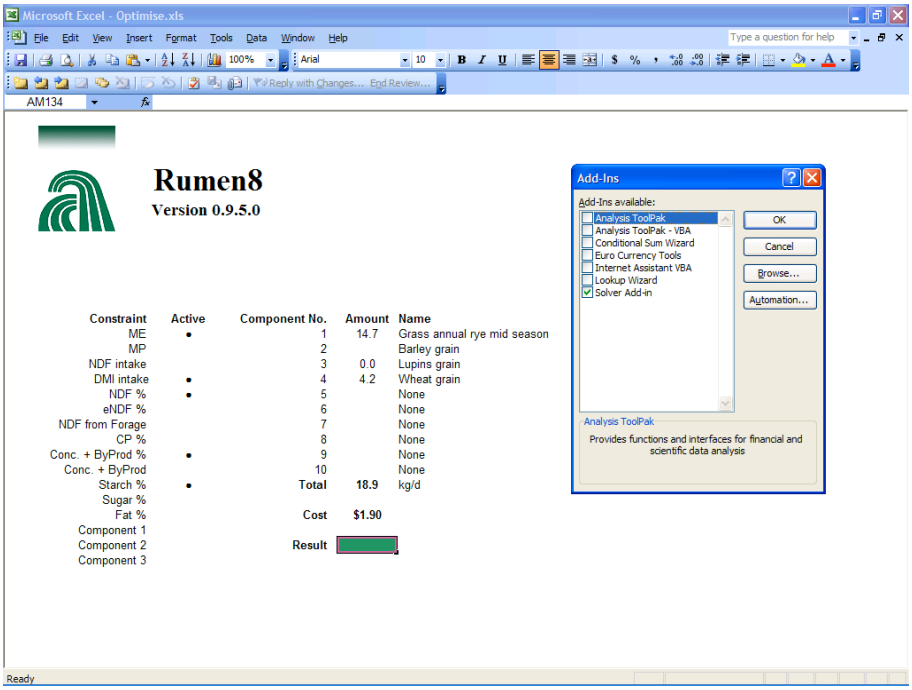
   If Excel's security level is set to high it will automatically disable the Optimiser macros that will prevent Rumen8 from optimising diets. Select 'Tools -> Macro -> Security' from the menus. Set Macro security to Medium. If you previously had security set to a higher level than medium you should confirm lowering it is advisable in the environment in which your computer operates. Information about this can be found in the Excel help by searching on 'Macro Security Levels'.

Figure 68. Macro security in Excel 2003.



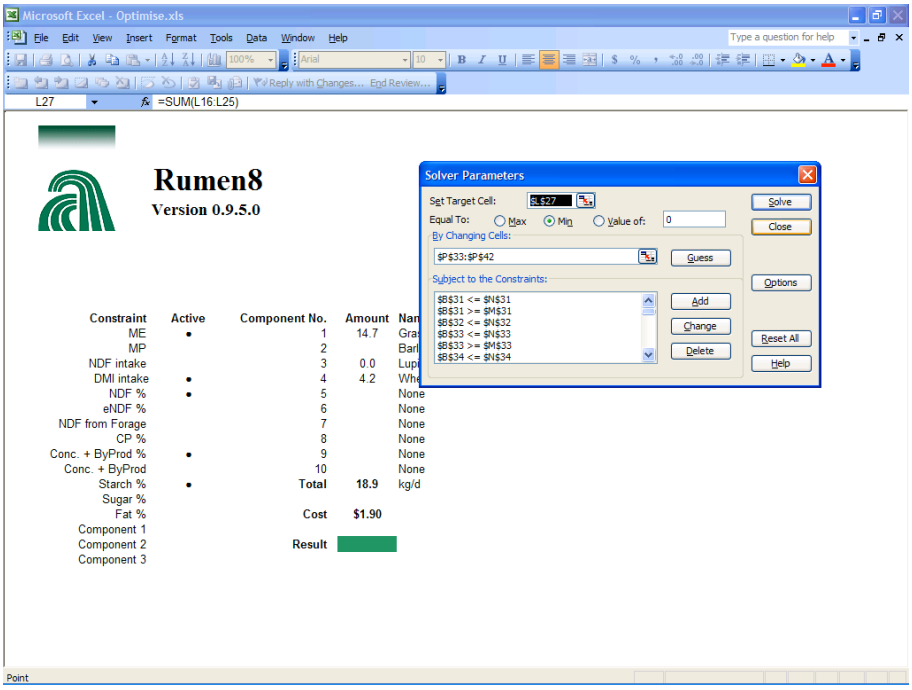
3. Once you have reset macro security to medium close Excel and then re-open the Optimiser.xls to continue with the setup.
4. Menus may vary slightly from those described below unless you have 'Always show full menus' selected under the 'Tools -> Customize' menu under the 'Options' tab.
5. Enable the Solver add-in by selecting 'Add-Ins…' from the 'Tools' menu. Ensure the check box along side Solver has a tick as shown below.

Figure 69. Install the Solver add-in in Excel 2003.



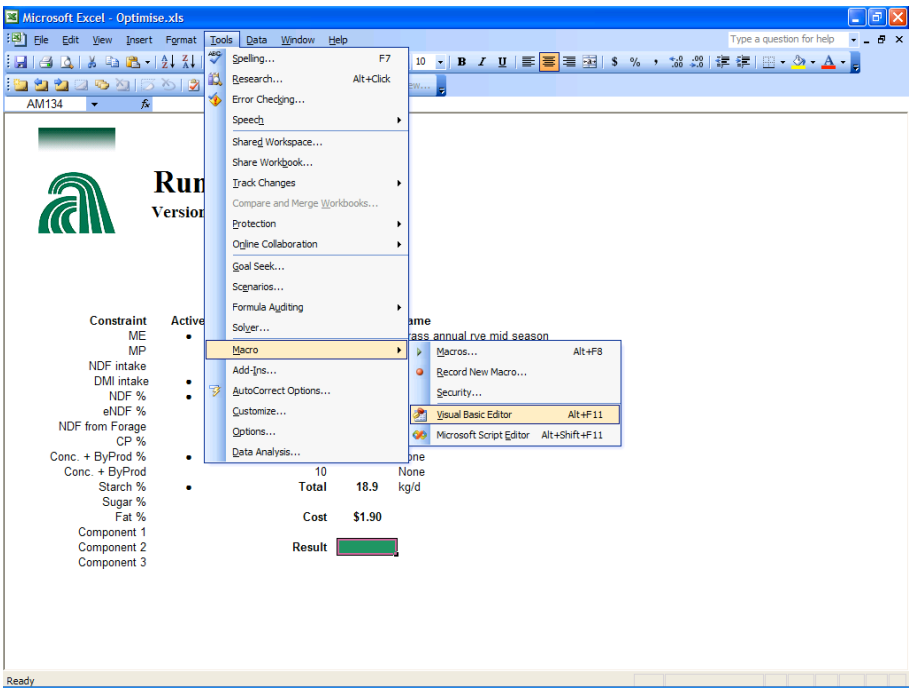
6. Confirm Solver is correctly installed by selecting Solver from the Tools menu.

Figure 70. Confirm installation of Solver in Excel 2003.



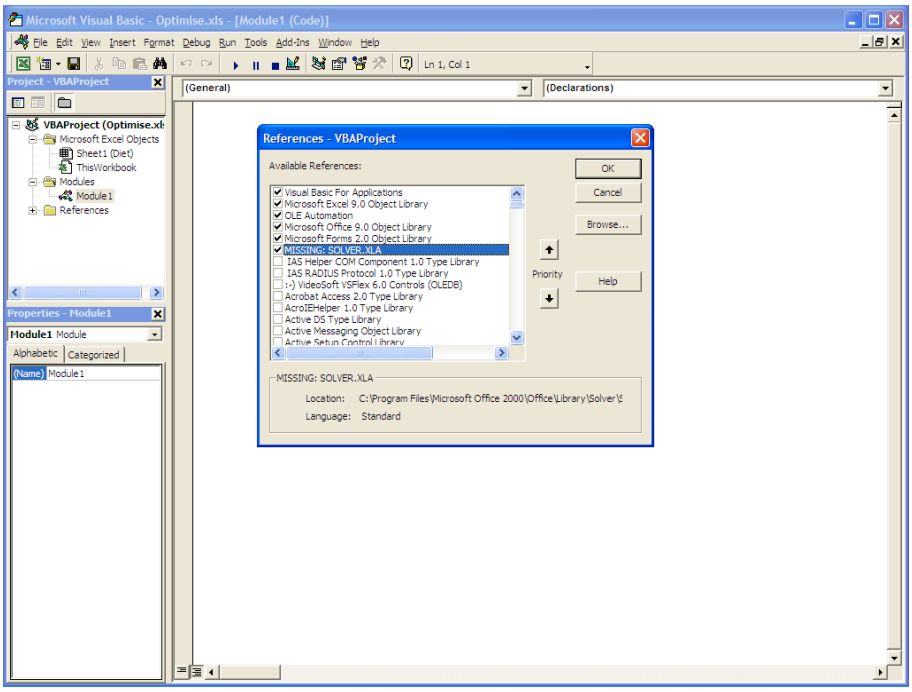
7. Exit from Solver by clicking on the Close button.
8. Start the Visual Basic Editor by selecting 'Tools -> Macro -> Visual Basic Editor' menu as shown below.

Figure 71. Start the Visual Basic editor in Excel 2003.



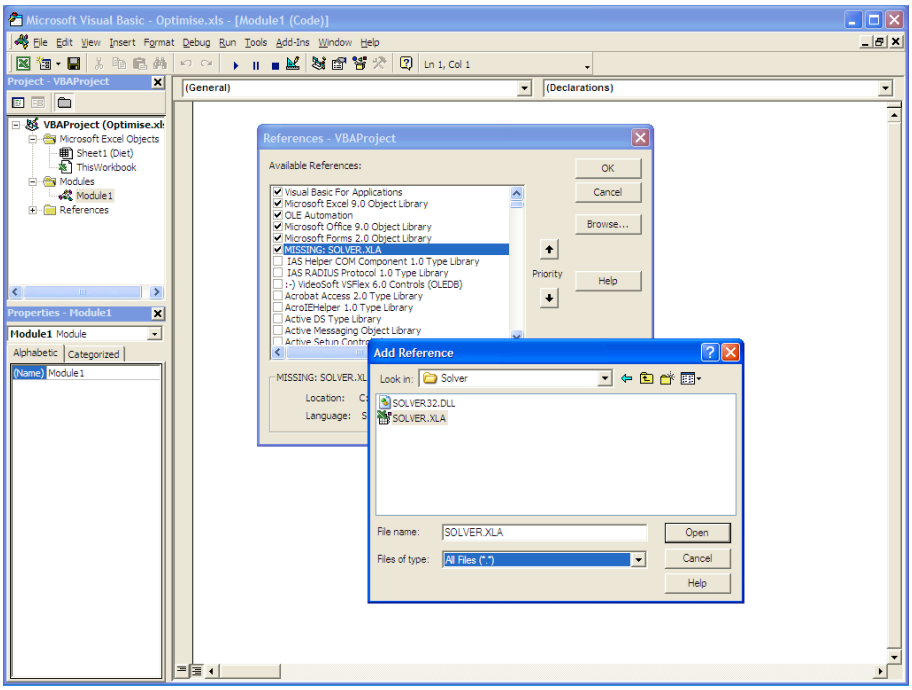
9. In the Visual Basic Editor select ‘References’ from the ‘Tools’ menu. This will bring up the References dialog box with an entry for Solver.xla, usually with ‘Missing’ alongside it. You may need to search down the list to find it.

Figure 72. Solver setup for Visual Basic in Excel 2003.



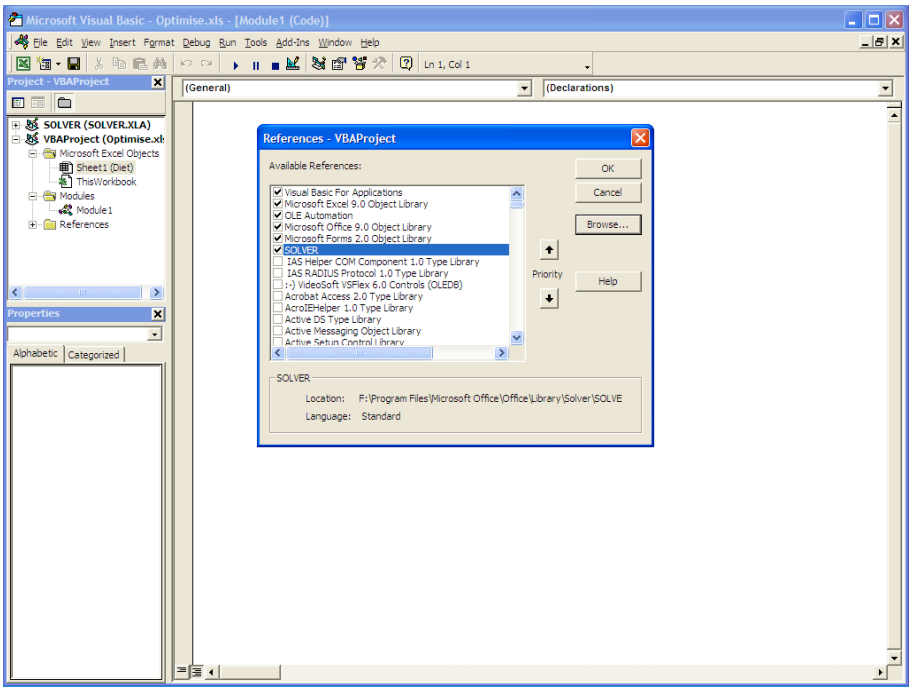
10. Visual Basic needs to know where to find the Solver add-in. Click the ‘Browse’ button and navigate to the directory in which Microsoft Office has installed the solver files. This is usually
‘C:\Program Files\Microsoft Office\Office\Library\Solver’
At the bottom of the dialog box change the ‘Files of type’ drop down to show all files. Solver.XLA should now become visible. Select it and press ‘Open’.

Figure 73. Locate the Solver.xla file in Excel 2003.



11. The Solver reference should no longer be listed as missing.

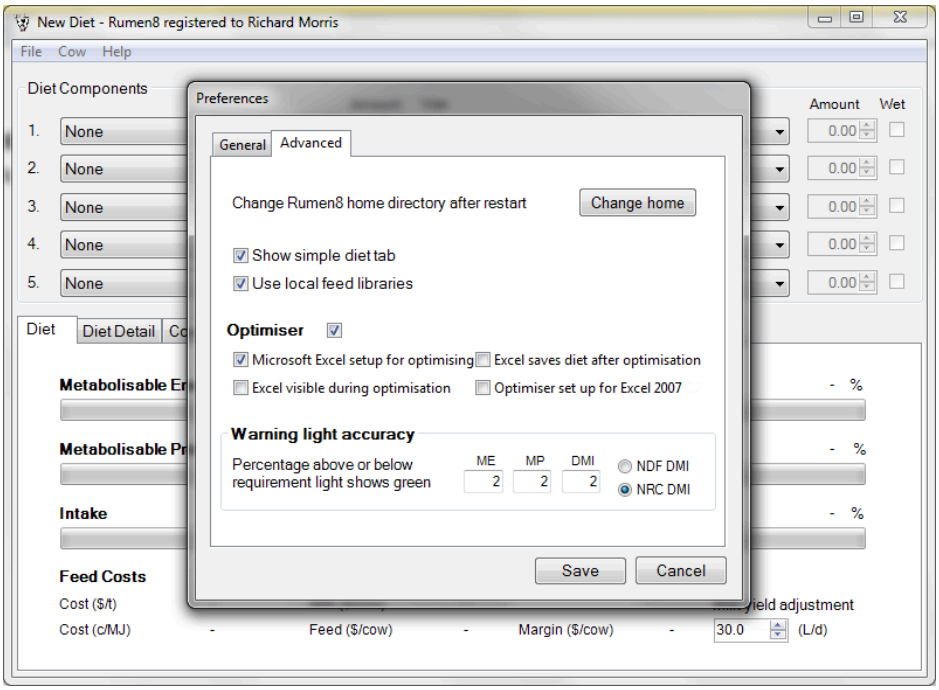
Figure 74. Solver is now configured for use by Visual Basic in Excel 2003.



12. Click on okay to close the References dialog box and save the Spread sheet using 'File -> Save Optimise.xls' from the menu.
13. Select 'File -> Close and return to Microsoft Excel' to return to the Optimise spread sheet.
14. Exit from Excel saving the changes.

15. Excel setup for use with Rumen8 optimisation is now complete and Rumen8 can now be started.
16. Rumen8 defaults to not allow access to the optimiser so the final step is to tell it you have configured Excel correctly. In the Rumen8 Preferences first enable the Optimiser tab by ticking the option and then the "Excel/Solver installed" option should be also ticked. Also ensure the last Optimiser preference to tell Rumen8 you are using Excel 2007 is un-ticked.

Figure 75. Setup the Rumen8 preferences to use the optimiser.



Now when you return to the main Rumen8 window a new tab called 'Optimiser' will be available.

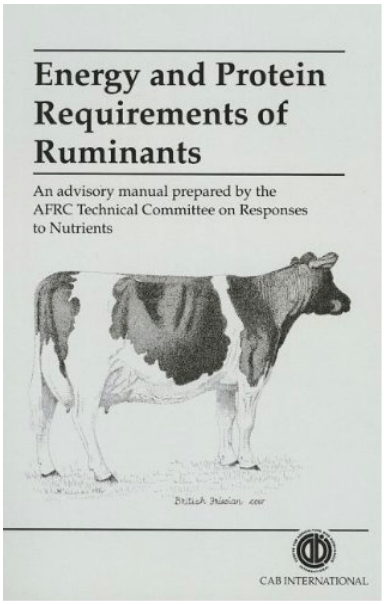
References

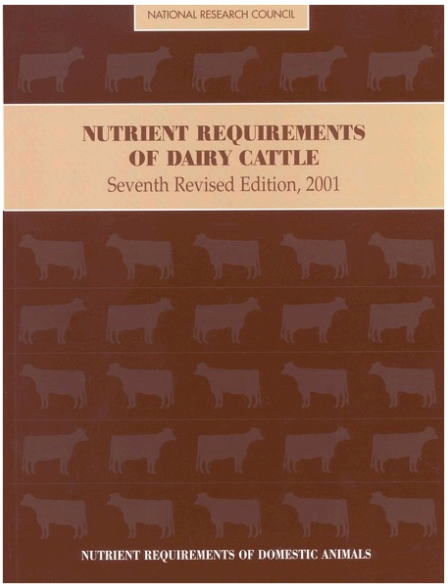
Rumen8 is based on the AFRC (1993) feeding standard and the calculation of cow intake is from NRC (2001).
Rumen8 version 1 has been independently evaluated by Dairy Australia Grains2Milk project and the report can be downloaded from the Rumen8 and Dairy Australia websites.

AFRC (1993) *Energy and Protein Requirements of Ruminants* An advisory manual prepared by the AFRC Technical Committee on Responses to Nutrients. CAB International, Walingford, UK.

Little S., King R., Lean I., Rabiee A. and Breinhild K. (2009) *A review of 11 applied dairy nutrition models used in Australia. Summary Report.* Grains2Milk project, Dairy Australia.

NRC (2001) National Research Council. *Nutrient Requirements of Dairy Cattle: Seventh Revised Edition, 2001*. Washington, DC: The National Academies Press, 2001.


Energy and Protein Requirements of Ruminants
An advisory manual prepared by the AFRC Technical Committee on Responses to Nutrients
CAB INTERNATIONAL


NATIONAL RESEARCH COUNCIL
NUTRIENT REQUIREMENTS OF DAIRY CATTLE
Seventh Revised Edition, 2001
NUTRIENT REQUIREMENTS OF DOMESTIC ANIMALS

Abbreviations

Abbreviation	Units	Description
A	MJ/d	activity allowance
ADIN	g/kg DM	acid detergent insoluble nitrogen
aN		proportion of water soluble N in the total N of the feed
Ash	g/kg DM	Ash
Balance (MJ)	MJ	the difference between metabolisable energy requirements and supply
bN		proportion of degradable N, other than water soluble N, in the feed
Calcium	g/kg	concentration of calcium in the diet
Calcium	g/kg DM	Calcium
Cl	MJ/d	plane of nutrition correction factor in calculating ME requirements
cN		Fractional rumen degradation rate per hour of the b fraction of the feed N with time
Comp. 1	kg	the amount of component 1 must fall within specified minimum and maximum values
Comp. 2	kg	the amount of component 2 must fall within specified minimum and maximum values
Comp. 3	kg	the amount of component 3 must fall within specified minimum and maximum values
Con+By (kg)	kg	concentrate and byproduct in the diet
Conc. + ByPr.	g	the total amount of concentrate + byproduct in the diet must fall within specified minimum and maximum values
Conc. + ByPr.	g/kg	the concentration of concentrate + byproduct in the diet must fall within specified minimum and maximum values
Cost	$/cow and c/MJ	diet cost ($/cow and c/MJ) and margin ($/cow)
Cost	$/tonne	cost to produce or buy 1 tonne of feed (nominate if wet or dry)
Cost ($/t)	$/tonne	diet cost per tonne
Cost (c/MJ)	c/MJ	diet cost on a metabolisable energy basis
Cost A.L. DM	$/tonne DM	cost after losses on a dry matter basis
Cost A.L. wet	$/tonne wet	cost after losses on a wet or fresh basis
CP	g/kg	the concentration of CP in the diet must fall within specified minimum and maximum values

Abbreviation	Units	Description
CP	g/kg DM	crude protein
Cysteine	g/kg DM	Cysteine
Days in milk	d	number of days the cow has been lactating
Days pregnant	d	number of days the cow has been pregnant
Distance walked	m/d	distance walked each day by cow
DM	g/kg	dry matter
DMI	kg and %	dry matter intake (kg) and % of maximum intake (NDF/NRC methods)
DMTP	g	digestible microbial true protein
DUP	g	digestible undegraded protein
Ec	MJ/d	net energy retained in concepta
El	MJ/d	net energy secreted as milk
Em	MJ/d	net energy for maintenance
eNDF	g/kg	the concentration of effective NDF in the diet must fall within specified minimum and maximum values
eNDF	g/kg DM	effective neutral detergent fibre
eNDF (%)	%DMI	effective NDF in the diet
ERDP	g	effective rumen degradable dietary protein
ERDP CP	%	percentage of the CP that is effective rumen degradable dietary protein
ERDP CP%	%	percentage of the CP that is ERDP
Excess MP	g	MP in excess which will require ME to remove
Excess MP cost	$??	the metabolic cost to remove excess metabolisable protein expressed as forgone weight change or milk production
F	MJ/d	fasting metabolism
fat	g/kg	the concentration of fat in the diet must fall within specified minimum and maximum values
Fat	g/kg DM	Fat
Feed ($/cow)	$/cow/day	feed cost
FME	MJ	fermentable ME of the diet
Height walked	m/d	height change during walk each day
Histidine	g/kg DM	Histidine
Intake (kg)	kg	the maximum DMI cannot exceed 100% as determined by liveweight, milk yield and week of lactation
Intake (max. NDF)	g	the maximum DMI cannot exceed 100% as

Abbreviation	Units	Description
		determined by NDF intake and liveweight
Kc		efficiency of utilisation of ME for growth of the concepta
Kg		efficiency of utilisation of ME for weight change when lactating
Kl		efficiency of utilisation of ME for lactation
Km		efficiency of utilisation of ME for maintenance
Kt		efficiency of utilisation of mobilised tissue for lactation
L	MJ/d	level of feeding as a multiple of MJ of ME for maintenance
Limited by		factor limiting MP supply
Live weight	kg	the cows liveweight
Live weight change	kg/d	cows daily liveweight change
Losses	%	dry matter loss from feed after costing
Lys:Meth		ratio of lysine to methionine in the diet
Lysine	g	total lysine in the diet
Lysine	g/kg DM	Lysine
Magnesium	g/kg	concentration of magnesium in the diet
Magnesium	g/kg DM	Magnesium
Margin ($/cow)	$/cow/day	margin (milk income - feed costs)
Max DM Intake %	%	percentage of predicted maximum intake currently provided by the diet based on liveweight, milk yield and stage of lactation
Max MP cost	MJ	Maximum ME cost to remove excess MP
Max NDF DMI %	%	percentage of predicted maximum intake currently provided by the diet based on NDF intake and liveweight
Mc	MJ/d	ME requirement for growth of concepta
MCP	g	microbial crude protein
ME	MJ	metabolisable energy supplied and required
ME	MJ/kd DM	metabolisable energy
ME requirement	MJ	the diet must provide the ME required for maintenance and production
Methionine	g	total methionine in the diet
Methionine	g/kg DM	Methionine
Mg	MJ/d	ME requirement for liveweight change when lactating

Abbreviation	Units	Description
Milk ($/cow)	$/cow/day	milk income
Milk fat	% m/v	percentage of milk that is fat
Milk lactose	% m/v	percentage of milk that is lactose
Milk protein	% m/v	percentage of milk that is true protein
Milk yield	L	daily milk production
Min MP cost	MJ	Minimum ME cost to remove excess MP
Ml	MJ/d	ME requirement for milk production
Mm	MJ/d	ME requirement for maintenance
Mmp	MJ/d	ME requirement for maintenance and production
MP	g	metabolisable protein
MP balance	g	metabolisable protein balance
MP min. requirement	g	the diet must provide an MP supply at least that required for maintenance and production
MP required	g	the amount of metabolisable protein required for the production level
MPb	g/d	basal endogenous nitrogen requirement
MPc	g/d	MP requirement for the growth of the concepta
MPd	g/d	dermal loss as scurf and hair
MPg	g/d	MP requirement for liveweight gain when lactating
MPI	g/d	MP requirement for milk production
MPm	g/d	MP requirement for maintenance
MPmp	g/d	MP requirement for maintenance and production
MTP	g	microbial true protein
NDF	g/kg	the concentration of NDF in the diet must fall within specified minimum and maximum values
NDF	g/kg DM	neutral detergent fibre
NDF (%)	%DMI	neutral detergent fibre in the diet
NDF (kg)	kg	total NDF in the diet
NDF forage	g/kg	the concentration of NDF from forage in the diet must fall within specified minimum and maximum values
NDF frge (%)	%DMI	NDF in the diet supplied from forages
NFC (%)	%DMI	non fibrous carbohydrate in the diet
Phosphorus	g/kg	concentration of phosphorus in the diet
Phosphorus	g/kg DM	Phosphorus
Position changes	no./d	number of body position changes per day

Abbreviation	Units	Description
Protein	g and %	metabolisable protein supplied and required and crude protein %
QDP	g	quickly degradable protein
Qm		metabolisability of GE at maintenance
r(fraction/hr)		rumen digesta fractional outflow rate per hour
RDP	g	rumen degradable protein
Required (MJ)	MJ	metabolisable energy supply required from the diet for specified production
SDP	g	slowly degradable protein
Source	source of information	FIM (feed information manual) / TFD (top fodder data) / VMF (Vasse Milk Farmlets) / MvHS (M Staines data) / Protein Plus project etc
starch	g/kg	the concentration of starch in the diet must fall within specified minimum and maximum values
Starch	g/kg DM	Starch
Starch (%)	%DMI	starch in the diet
sugar	g/kg	the concentration of sugar in the diet must fall within specified minimum and maximum values
Sugar	g/kg DM	Sugar
Sugar (%)	%DMI	sugar in the diet
Threonine	g/kg DM	Threonine
Time standing	hr/d	time cow spends standing each day
Total (kg)	kg	total dry matter in the diet
Total (MJ)	MJ	total metabolisable energy supplied from the diet
Total MP (g)	g	total metabolisable protein in the diet
Type	name	other forage / grass silage / other silage / distillery product / other non-forage
UDP	g	undegradable dietary protein
y	g	potential microbial protein yield in the rumen from FME